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ROLE OF ENDOCRINOLOGY IN ORTHODONTICS*

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REVIEW OF THE DUCTLESS GLANDS AND THEIR FUNCTION IN GROWTH AND DEVELOPMENT

WE ALL are familiar with the anatomy of the endocrine glands; with their unique importance for the functioning of the body, and with many well-characterized diseases which originate from their pathologically increased or decreased activity.

We all are—more or less—aware of the multitude of interrelations between the ductless glands and their intimate relation to the autonomic nervous system. The threads of functional cooperation and counteraction are so manifold and interwoven that it is very difficult indeed to obtain a clear view of their respective physiological and diseased processes.

Take, for instance, calcium metabolism and bone formation. Many of you have studied these subjects very thoroughly. You remember that almost all the endocrine glands and most of the hormones have been found to have some influence on these processes, but I doubt whether any one can reproduce the many particulars from memory—I certainly cannot.

In order to promote understanding, my first aim will be to determine in a simple way the general mechanism of endocrine action. Only in doing so are we able to keep the endocrine and hormonal therapy within the limits of physiological possibilities and to avoid mistakes so frequently caused by overenthusiasm or lack of critical thought.

*From the Medical Division, Montefiore Hospital.
Read before the North Atlantic Orthodontic Society, Jan. 26, 1938.

Let us start with the fundamental statement that the endocrine glands or the endocrine system serves the purpose of coordinating the many vegetative functions, which take place constantly in a highly organized and highly complicated organism.

The endocrine system performs this task by means of hormones. Hormones are chemical compounds of a relatively simple structure, but of singular specificity. They are not specific in so far as the species is concerned, as—for instance—proteins are. On the contrary, in this regard, they show rather an unsurpassed lack of specificity; for the same hormones are found through all nature, in the entire animal kingdom and even in plants. This fact explains the reason for and the basis of our success in obtaining hormone preparations from animals and utilizing them for human beings.

The singular specificity of hormones is of a functional character. One particular hormone controls one special function and cannot be replaced by another hormone. Thus insulin controls carbohydrate metabolism, and parathyroid hormone controls one important branch of calcium and bone metabolism. In other instances well-defined tissues react specifically to certain hormones. Such tissues may form a structure of large anatomical proportions, as, for instance, the mucous membrane of the uterus, on which the follicular and corpus luteum hormones act specifically; or the tissue concerned may be of microscopic size but may extend throughout the entire body, as the nerve endings of the autonomic nervous system, on which the nerve hormones—acetylcholin and adrenalin—act specifically.

The next question which calls for serious consideration is: How does a hormone act? or What is the general mechanism of hormone activity? I have asked this question repeatedly, and I have always received the same erroneous answer, namely, that hormones act like enzymes. Enzymes, of course, act on chemical compounds, splitting or synthesizing. But hormones do not. Insulin does not act on sugar, and parathyroid hormone, not on calcium compounds.

Hormones act on living structures, cells or fibers, exclusively. They change, alter, or influence the architecture of the protoplasm, including its surface and permeability. This alteration goes through all the stages possible, from coagulation to dissolution, depending upon the character of the protein or the protoplasm, and also upon the dose of the hormone in question. Thus, for instance, parathyroid hormone is able to dissolve osteoid tissue and, in larger doses, to necrotize osteoid as well as other tissues.

Change of the structure of protoplasm always goes with binding or releasing of water. The influence of most of the hormones on the metabolism of water is known: insulin produces edema; thyroxin has a diuretic effect. As growth is always preceded by binding of water and some kind of swelling, the growth hormone, which is an important factor in many problems of orthodontics, exercises in this regard a particularly strong influence.

In order to produce a specific action, the hormone must be bound or joined to the particular structure, in conformity with the old biological law *Corpora non agunt nisi fixata* (the action of compounds follows their fixation).

This fixation of hormones, which establishes their contact with the reacting system, is due to a specific chemical or physical affinity. For the understanding of endocrine disorders it is of utmost importance to realize that this affinity has a remarkable variability, individually as well as under different diseased or even normal conditions. Some individuals, for instance, are extremely sensitive to insulin generally or at certain hours of the day, or when stricken with fever, etc. Others do not react at all or only to extreme doses. Thus a diabetic patient, whom I have seen with Dr. Herbert I. Wiener, had to be administered 3,200 units of insulin in twenty-four hours; this is ten times the amount of insulin produced in the body of normal men. From the so-called shock therapy of dementia praecox we know that an individual may go into shock after 10 to 20

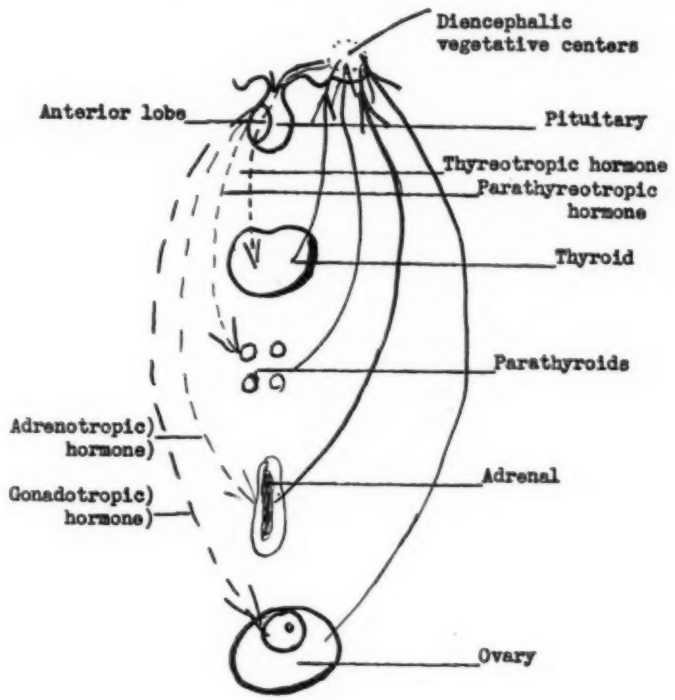

Fig. 1.

units on one day and not be affected by 200 units on another. In order to understand endocrine disorders it is of *equal importance to consider the production of and the reactivity to hormones.*

The endocrine system and a large part of the interwoven relations of the endocrine glands can be understood very easily. It is important to obtain a clear idea of the interrelation between growth, rather growth hormone, and sexual maturity.

Without going into details, I should like to give you a bird's-eye view. Flying above the endocrine battlefield, we get the panorama shown in Fig. 1.

The anterior pituitary, the superimposed endocrine gland, sends out hormones which influence specifically a number of subordinated glands; i.e., thyroid, parathyroid, adrenals, gonads, etc. The tropic hormones of the anterior

pituitary stimulate the production of other hormones. Thyreotropic hormone stimulates the thyroid gland to produce thyroxin. Each of these hormones fulfills a specific task on the end organ or reacting tissue coordinated to it, but also is able to diminish the activity of the anterior pituitary generally or in one of its parts.

This braking (checking) influence is not achieved by direct action of the hormones on the anterior pituitary, but by action on the vegetative centers in the diencephalon. The anterior pituitary is controlled from these centers by direct nervous communication. Thus we have the production of hormones controlled by a hormonal-nervous circle.

The diencephalon is not only a part of the central nervous system but at the same time an endocrine gland, for it contains many hormone-producing cells. In both respects the diencephalon corresponds to the posterior pituitary. The

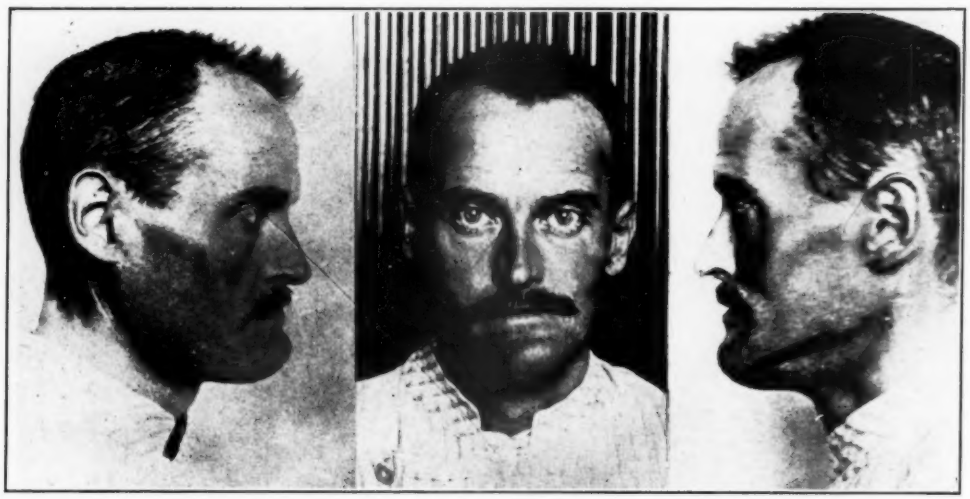

Fig. 2.—Case of acromegaly. Pathological growth of the right mandible.

hormones produced in these nervous parts influence the vegetative centers directly. Their main field of action lies in close proximity to their production. By recognizing the hormonal attack on those central spheres which control the production of most of the hormones, we are able to understand the influence of many hormones and endocrine glands on skeleton and calcium metabolism. The parathyroids only act directly on the bones. All the others are able to influence the production of the parathyreotropic hormone, and so the skeleton. Disorder of bones and teeth resulting from the loss of all the parathyroids cannot be remedied by any other than the parathyroid hormone.

Further, of great importance is the growth hormone, whether it exists as a simple compound or not.

The pituitary factor, responsible for growth, has a fairly complicated structure. Within it there is one element which influences all the organs equally and causes either symmetrical growth or pathological overgrowth, or giantism. Lack of this element in a growing individual results in dwarfism (pituitary

dwarfism). Loss of the growth factor in an adult causes splanchnomiery; i.e., reduction in size of the organs, as evidenced in Simmonds' disease. From this it is evident that this factor or hormone is responsible for the maintenance of the size of the organs, but apart from this factor there are others which control the size of special organs and sometimes cause pathological growth of these particular organs. All tropic hormones act in this manner. They control function, preservation, and growth of their specific end organs. Hence, in pituitary diseases or diseased conditions of the diencephalic-pituitary complex we find, for instance, hypertrophy of the adrenocortex or the parathyroids, etc., either in the form of generalized hypertrophy or hyperplasia or in the form of adenomas. Development of the breasts in pregnancy can be considered a phenomenon of growth. The gonadotropic hormone stimulates the formation of ovarian hormones, which, in turn, influence the growth of all the tissues connected with the production of the species.

Fig. 3.—Jaw of an acromegalic person, compared with the jaw of a normal adult.

The pituitary growth factor is present throughout life. Growth takes place continuously, but it does so in a completely regulated manner. In acromegaly growth gets out of control. It is very interesting to analyze what is happening in acromegaly. The overgrowth of the lower jaw in acromegaly may be seen in Fig. 2. In most cases not all the tissues capable of growing actually do so. Only in a relatively small number of cases do the viscera increase in size. The jaws show overgrowth most readily, but there is a case in which the right mandible showed pathological growth, the left jaw did not (Fig. 3). Therefore it is evident, and in agreement with the part played by the end organ in hormonal effects, that the presence of a surplus of growth factor is not sufficient to cause growth. The readiness of the tissue to react to the hormone is a matter of equal importance.

In many cases of orthodontic interest we are concerned with the sequence of events during the period of embryonic development. I have no doubt that in this period a number of growth and other factors are active. All the numerous

evolutionary events are caused by specific factors, specific also as to time and locality of action. Here we find exact regulation, cooperation, and synchronization.

Thus, for instance, if the anlage of the permanent teeth, which should take place shortly after the development of the bud of the enamel organ of the deciduous teeth, does not appear in due course—as it occurs, particularly, in the case of the lateral incisor and the third molar—its development can by no means be brought about at any later period in the embryonic or the postnatal life. Many congenital defects and malformations are due to a failure in hormonal coordination during a limited and precisely defined period of embryonic life. They represent a final state and cannot be straightened out by hormonal therapy.

Fig. 4.

Figs. 4 and 5.—Girl, 12 years old. Precocious maturity. Cystic bone disease in right humerus and right femur. Eburnation of the right temporal region, around the right orbit and at the right base of the skull. Pigmented spots.

ETIOLOGICAL RELATION OF GLANDULAR DYSFUNCTION IN THE PATTERN OF DENTAL GROWTH

The growth of the bone, in the embryonic and postnatal development, is exercised by the thyroid gland, or, more correctly expressed, this seems to be the case. In cretinism, mongolism, or hypothyroidism in childhood, growth is diminished but not ended. Due to the simultaneous retardation of sex maturation, the epiphyseal junctures remain open and growth remains possible. In so far as the jaws and teeth are concerned, there is an arrest of the growth of the jaw, particularly the mandible. Deciduous dentition, shedding, and the eruption of the permanent teeth are slow and delayed. The teeth are

small, overlapping, and crowded. There is malalignment, malposition, and malocclusion. Not infrequently teeth are missing.

Myxedema frequently is caused by primary hypofunction of the anterior pituitary. When pituitary disorder or weakness occurs, in deficiency of growth hormone there are very characteristic features; namely, undeveloped bones of the face, particularly the maxilla, a narrow, high arch, and recession of the chin, a birdlike face. The size of the teeth, whether normal or smaller, does not correspond with the size and growth of the jaw; hence the teeth are crowded and malocclusion results. This picture is realized in the not very frequent cases of *pituitary dwarfism*.

Fig. 5.—Same case as shown in Fig. 4.

But it does not occur in every type of hypofunction of the anterior pituitary. Thus in infantile pituitary obesity, so-called Fröhlich's syndrome, the most frequent disorder of the pituitary-diencephalic complex, we see lack or delay of sex maturation, but the growth of the skeleton carries on, producing solid bones, a large face and very strong teeth, in good arrangement and comparatively free from caries.

In the particular form of endocrinal disorder which goes with persistence of the thymus gland, the teeth are bluish white and lack uniformity in size and development. The central incisors are larger and the lateral incisors underdeveloped. The canines do not have the normal, fanglike character.

The lack of involution of organs and endocrine organs, such as the thymus and the pineal gland in particular, certainly has a hormonal background.

In premature development, as in cases of pineal gland pathology followed by anterior lobe hyperactivity, we find early eruption of the permanent teeth. Acromegaly in adolescence brings about premature dentition, large teeth, spreading and spacing, due to a lack of coordination in the growth of mandible and teeth.

For the past few years a new endocrinal disorder in childhood has become known. We have analyzed two cases (Figs. 4-10). This very characteristic picture begins with precocious maturity, mental as well as sexual, due to an early start of production of the gonadotropic hormone. This goes with an increased activity of the parathyreotropic hormone. Through hyperactivity of the parathyroids, these children develop osteitis fibrosa generalisata or eburnation of bones (marble disease). Dentition, deciduous as well as permanent, takes place prematurely. In most of the cases pigmentation of the skin appears, sometimes

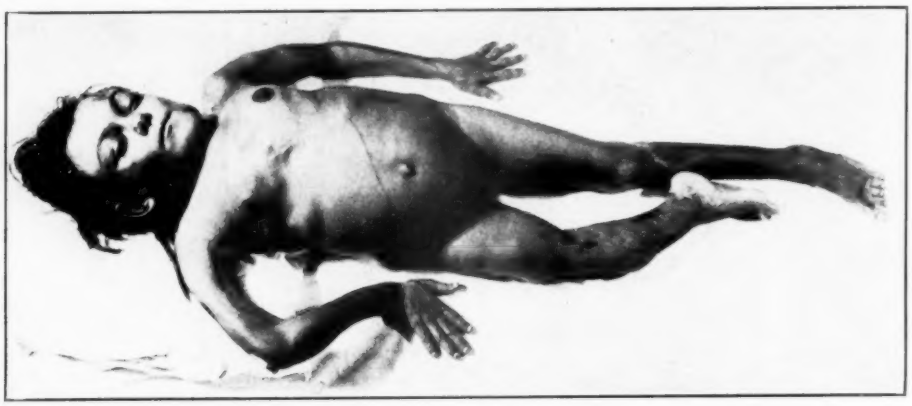

Fig. 6.

Figs. 6-10.—Girl, 9 years old. Precocious maturity. Most serious osteitis fibrosa. Marked eburnation at the base of the skull. Hyperthyroidism, hyperpigmentation, ovarian cyst, hyperglycemia.

in a distribution following the course of nerves. The teeth participate in the disorder in various ways. Diseased processes of the jaw, such as cysts and fractures, may cause loss of teeth and malocclusion as well. But minor disorders of the jawbone, such as disorder in trabeculation, also may result in malocclusion. Because of malocclusion the shedding of some of the deciduous teeth may be delayed or may become altogether impossible. Thus both the permanent and the deciduous teeth are crowded, in malposition and malalignment, as in the case of this type shown in Figs. 6-10.

Prognathy, large teeth, and spacing in spite of large or normal-sized teeth generally point to overactivity of the anterior pituitary. Micrognathy, birdlike face, and small teeth can be considered as due to a decreased activity of this gland.

In many instances, however, abnormalities in which the dentist and the orthodontist take great interest, such as crowding, torsion, and inversion of teeth, are a matter of heredity, the mixture of chromosomes or genes. The

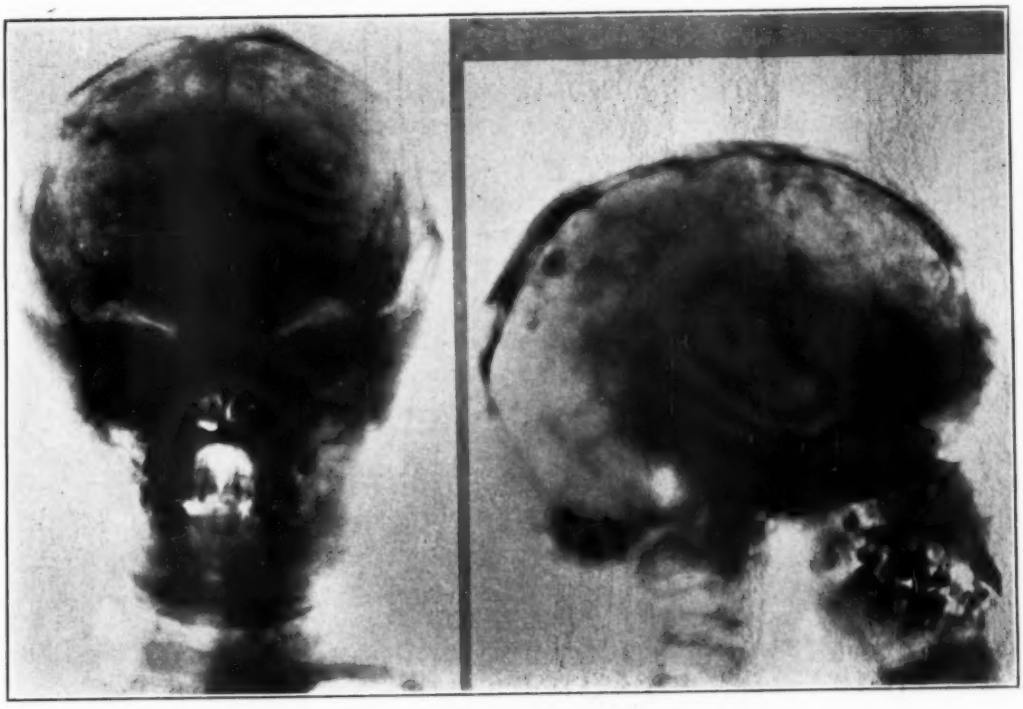

Fig. 7.

Fig. 8.

Fig. 9.

Fig. 10.

inheritance of the small jaw of the mother and the large teeth of the father is an example of such an abnormality as pointed out by Zuckerkandl. In this group the hereditary character is particularly obvious when other anomalies of the ectoderma, namely, a subnormal number of teeth and hypertrichosis lanuginosa, are present. Such cases cannot and never will be benefited by hormonal therapy.

Aside from such orthodontic abnormalities which go with characterized diseases, there are as single features the insufficient closure between the intermaxillary bone and the superior maxilla, and, correspondingly, a free space between lateral incisor and canine, the so-called diastema. The insufficient unification of the maxilla in the middle line goes with spacing between the incisors and with a deep furrow (sulcus) in the alveolar process. These abnormalities have a relationship to the mechanism of growth and possibly are influenceable by hormones, growth hormones or thyroid hormone, when administered at the proper time. How late in the postnatal life therapy may prove efficacious is beyond my knowledge or experience.

THERAPY

In so far as the indication for hormonal therapy is concerned, it is essential to investigate whether an anomaly has an endocrine basis or whether it is due to hereditary circumstances. Further, we should determine whether the endocrine disturbance is still reversible and whether it can be influenced by hormones. This certainly is true of delayed eruption, some of the cases of insufficient growth of the jaw, but not of missing or supernumerary teeth, of transposition or inversion. Most frequently thyroid hormone will be chosen. In rare cases growth hormone may prove useful. In cases of persistence of the thymus, sex hormone (female or male) could be tried. Whether this has been done, I do not know.

We must not forget, however, that in endocrinology the features do not always fit the scheme of diseases as outlined in textbooks. Particularly in childhood there are a good many mystery cases, and dentists and physicians must join forces in order to analyze these riddles and to make progress.

In our present, still limited, and unsatisfactory state of knowledge all the cases of atypical mixture of endocrine features and the cases with hereditary abnormalities of the teeth are of particular importance. We must never be satisfied with a diagnosis as pluriglandular disease or with the vague conception that disturbance of one gland results in dysfunction of others. We want more, and we must analyze every single case. In childhood and adolescence, particularly, the cooperation of dentists and orthodontists is of the utmost importance.

IMPACTIONS AND PSEUDOIMPACTIONS

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IMPACTIONS

FOR the purpose of this discussion an impacted tooth will be defined as one which has failed to erupt, either completely or in any degree whatsoever, because of its position within the jaw. It will be noticed that this definition excludes that group of unerupted teeth the etiology of which is concerned solely with systemic diseases, such as cretinism, myxedema, and cleidocranial dysostosis.

Any tooth whatsoever may be subject to impaction, but some are more so than others. Kronfeld gives the order of frequency thus: mandibular third molars (most frequent), maxillary cuspids, bicuspids, supernumeraries. To this scale, it would seem, should be added the mandibular second molars, with a frequency equal perhaps to that of the bicuspids.

The important cause of impaction is lack of space. This lack leads to impaction among some teeth more than others, notably the maxillary cuspid and the mandibular third molar. Let us trace the possible effects in the case of the maxillary cuspid. This tooth develops high up in the maxilla, above the root ends of the other maxillary teeth. The smallest displacement of the tooth germ, by crowding or otherwise, may be sufficient to turn the tip forward instead of downward, following which growth proceeds in a more or less horizontal direction, leaving the crown above or behind the incisor roots and the root above the bicuspids.

In the case of the mandibular third molar there is a somewhat similar sequence of events. In primitive races the mandible is adequate in length to accommodate the third molar in an upright position, and accordingly it is rare in those races to find the mandibular third molar impacted. In modern civilized races, on the contrary, the mandible is often found too short to accommodate all three molars in a vertical position. Moreover, the mandibular molars prior to eruption are normally tipped to the mesial. Hence, if the mandible fails to grow sufficiently in length, the mesial cusps of the third molar will become locked against the second molar.

In somewhat the same manner as the mandibular third molar becomes impacted, it is sometimes easy to cause inadvertent impaction of the mandibular second molar through careless use of the mandibular lingual arch.

Why the bicuspids should become impacted is difficult to explain on the basis of the foregoing reasoning. Nevertheless impactions are occasionally observed particularly in the case of the mandibular second bicuspid.

In the case of supernumerary teeth impaction can usually be accounted for likewise by lack of space.

Read before the Washington-Baltimore Society of Orthodontists, April 21, 1938, at Baltimore.

Important though it is in this etiology, lack of space is not the only cause or predisposing tendency in impaction. In a recognizable proportion of cases the only apparent factor in the anomaly is heredity, and this factor seems to occur more particularly in the case of the maxillary cuspid. We have all had cases, I am sure, where without crowding or other cause apparent, the same tooth has been found impacted in child and parent alike. Other causes for impaction are odontomas, overlying crowns, cysts, supernumerary teeth, and inflammatory processes near the tooth germ.

As sequelae to impaction may be mentioned the crowding of mandibular incisors, periodic pain, resorption of adjacent tooth roots, cyst formation, and in case of a partially erupted impaction, infection.

The crowding of mandibular incisors occurring at about the age of twenty years is frequently observed concomitantly with impaction of the mandibular third molars. It has been observed in untreated as well as in treated cases. A causal relationship between these two conditions has been disputed by some, but the fact that this crowding occurs so frequently just following the beginning of eruptive activity in the third molars, and after years of stability in the incisor region, suggests something more than accidental concurrence.

The usual experience with impacted teeth is to find no subjective symptoms. Numerous reports in the literature, however, would indicate that occasionally impacted teeth are accompanied by periodic pain which vanishes with removal of the impaction.

Resorption of tooth roots adjacent to the crown of the impacted tooth is familiar. The case of a patient is recalled who, presenting for examination, was found to have a mysteriously wobbly mandibular first molar. X-ray pictures revealed an impacted mandibular second bicuspid which had caused resorption of the entire mesial root of the first molar, leaving it supported only by the distal root in cantilever fashion.

The question of infection of impacted teeth is interesting to consider. On the basis of x-ray pictures showing radiolucent areas around the crowns of impacted teeth, we have in the past met with diagnoses of infection or cystic formation. Cyst formation can be verified, but according to histologists an impacted tooth completely embedded in the tissues cannot be infected. The dark area in the radiograph is usually nothing more nor less than connective tissue interposed between the enamel and the surrounding alveolar bone. When the impacted tooth is partially erupted, however, circumstances are widely different. The tooth is then accessible to all the bacteria and debris found in the mouth, and infection may develop very easily.

The histology of impacted teeth has been ably studied by Kronfeld, from whose work *Histopathology of the Teeth and Their Surrounding Structures* much of the foregoing has been taken.

Coming now to the subject of orthodontic treatment of impacted teeth, it should be borne in mind at the outset that when obstructing conditions are removed such teeth show a remarkable tendency toward voluntary eruption without any other orthodontic aid. The first step in treatment, therefore, should be directed toward providing adequate space where that is lacking. Adequate

space should be understood as meaning the space required by the tooth when in normal position plus a little additional to allow for the unhampered movement of the tooth toward that position.

If a retained deciduous tooth, a supernumerary, or an odontoma is an obstructing factor, this should obviously be removed. A supernumerary or an odontoma should be removed immediately. This would likewise be true generally in the case of a deciduous molar. In the case of a deciduous cuspid, however, if considerable additional space is needed, it may be desirable for esthetic reasons in some cases to leave the deciduous cuspid until required space has been gained.

At this point it would seem opportune to mention a procedure that was suggested by the late Dr. Hawley, which consists of the use of a vulcanite plate to stimulate eruption of the impacted tooth. With space adequate and with all obstructions removed, it is astonishing to see the high proportion of impacted teeth which erupt voluntarily under a vulcanite plate. The plate should be made, if possible, so that vulcanite covers the area overlying the impacted tooth, and an artificial tooth may be added to fill the vacant space. Care should be exercised to insure occlusal stress upon the plate sufficient in amount and so distributed that the desired area will be constantly stimulated. Within a year or two, under this procedure, a large proportion of impacted teeth, cuspids particularly, may be expected to appear at the surface.

The stimulating effect exerted upon an impacted tooth by a vulcanite denture is mentioned by Kronfeld, who observes that the belief among the laity in a third dentition is apparently based upon experiences of an impacted cuspid or bicuspid erupting under a full denture years after the patient supposed his last tooth had been extracted.

Even as orthodontic procedures go, however, the vulcanite plate as a means of effecting eruption of an impacted tooth must be considered a very leisurely measure. So if greater haste is desired, we must resort as a next step to surgical exposure. I delegate this to an oral surgeon, who exposes the tooth and packs the opening with gauze impregnated with vaseline. Sippel of Buffalo has demonstrated a method of exposing cuspids which employs no packing whatever. After exposing the tooth in such manner that the opening has the form of an inverted cone, insuring adequate covering of the bony margins with soft tissue, he sears this soft tissue with the electrocautery. A week later he cauterizes again, and still later he repeats if necessary. In this manner the tooth is kept exposed until it has sufficiently erupted.

With satisfactory exposure accomplished, the next step is to secure attachment. In the case of the cuspids, an excellent method has been demonstrated by Taylor of Denver. This simple method employs neither pin, band nor casting, but consists merely of an eyelet of twisted brass ligature wire cemented directly to the tooth. The tooth is cleaned and dried, but not wiped with alcohol, since the alcohol seems in some way to interfere with the adhesion of the cement. The cement used is the black copper variety. A generous dab is placed directly on the tooth, the twisted stem of the eyelet is covered with cement from the remainder on the slab, and then, with care as to positioning, settled into the

mass on the tooth. At another sitting, a ligature may be passed through the eyelet and attached to the appliance to be used for effecting movement.

I have used Taylor's method of attachment satisfactorily in other situations as well—for incisors and bicuspids and even for backward movement of impacted and partially erupted mandibular second molars. In the case of the mandibular second molar the attachment used is a round horizontal buccal tube to which are soldered two prongs for embedding in the cement (Fig. 1). On the buccal surface of a band on the first molar just anterior is soldered a Russell molar lock so positioned that the slot will be in line with the bore of the buccal tube when the latter has been attached to the impacted second molar. The first molar band is cemented and stabilized with a lingual arch. The buccal tube is then cemented directly to the impacted second molar in alignment with the slot of the Russell lock. At a later sitting a piece of 0.018 or 0.020 steel wire is cut to fit in the buccal tube and the Russell lock; over this wire is slipped an Arnold coil spring of desired length, and the whole seated as shown in Fig. 2.

Whatever method is used to accomplish eruption of the tooth it will usually be necessary to follow this step with the banding of the tooth and movement to position by means of customary appliances.

Fig. 1.

Fig. 2.

Coming now to a consideration of the impacted third molar, a factor to be taken into account here is whether all the other teeth in the same quadrant are intact, and still another is whether in treatment the dental arch has been expanded or contracted. If treatment has involved expansion, as is oftenest the case, and if all the other teeth in the quadrant are intact, the third molar is removed—with no regret for its loss. But, on the other hand, if there has been a loss of a bicuspid or a molar on the same side of the arch, or if treatment has involved the closing up of diastemas, then it may be important to retain the impacted third molar. In that case the orthodontic procedure would follow the line suggested for the impacted second molar.

The choice of time for removal of the impacted third molar may be an interesting topic for discussion. From the viewpoint of the orthodontist, the impacted third molar should be removed before the age at which the mischief occurs in the mandibular incisor region, in other words, before the age of eighteen to twenty, according to the individual dentition. But should it be removed very much before that time—at, for example, fourteen? Several reasons suggest themselves as to why it should not, generally speaking, be removed that early. In the first place, a third molar in impacted position at fourteen will sometimes be in an upright position, ready for free eruption, at eighteen or twenty. In the next place, at the early age of fourteen formation of the tooth

has progressed but little farther than the crown, and without the steadying effect of roots this crown, according to oral surgeons, is difficult to grasp with instruments, being free to revolve in the sac. Still another reason is the fact that accessibility is more difficult not only because growth of the jaw in the region of the third molar has not been attained but also because there will be a heavier layer of overlying bone. On the whole, therefore, it would seem that the balance of advantages would point to removal of the impacted third molar between the ages of seventeen and nineteen.

PSEUDOIMPACTIONS

A pseudoimpacted tooth will be defined as a tooth which has been prevented from completing its eruption apparently by reason of its position within the jaw but in reality by some other cause.

Before taking up etiology, incidence, etc., two cases will be shown that illustrate the condition in question, and a description given of their behavior under treatment.

Case 1 was that of a boy 8½ years of age, presenting for treatment in December, 1926. Models of the case are shown in Fig. 3, from which it is seen that the left maxillary first molar was barely through the gum, and apparently impinged on the left maxillary second deciduous molar. The right maxillary first molar had erupted normally. A radiogram of the region is shown in Fig. 4: another of the same region on the other side is shown in Fig. 5. The description of treatment which follows will be limited to the essential portions concerned with the supposedly impacted molar. An open groove in the occlusal surface of the tooth precluded any objection to the use of a pin cemented in a pit, and this accordingly was adopted as the means of attachment. By means of a Lourie ligature jack it was proposed to move the supposedly impacted tooth posteriorly. Space was actually created between the first molar and the second deciduous molar, but there was some doubt as to whether the first molar had moved backward, for the anterior teeth were suspiciously displaced, the arc being asymmetrical, with the teeth on the left side displaced anteriorly. Access had been gained, however, and thus it became possible to fit the first molar with a band carrying a horizontal buccal tube. From this band a vertical intermaxillary elastic was stretched to a band on the left mandibular first molar, the mandibular anchorage being reinforced with a lingual arch wire. Certainly no normal tooth would resist a constant force thus applied. But the tooth declined to budge; contrarily, it lifted the mandibular molar up toward its own level. By now more than two years had passed in treatment and the bicuspids had erupted; so a ribbon arch appliance was placed on the maxillary teeth, with bands on the two first molars, the two first bicuspids, and the four incisors. What would happen now? By degrees the arch wire was adjusted to bring the balky first molar into a plane with the other anchor teeth. Planes were changed, surely enough, but not the plane of the left first molar. The entire left side of the maxillary arch was raised to approach the level of the first molar, with the line of the incisal edges of the anterior teeth running on a bias. The first molar was conceded to be master for the present, and adjustments were made to restore the displaced teeth to their normal positions. This was accomplished

without difficulty, for the molar resisted intrusion as firmly as extrusion, and with the patient at the age of twelve the case was retained and developments were awaited. All second molars erupted normally and appeared to be moving toward occlusion. The patient was then sent to the oral surgeon, at whose hands

Fig. 3.

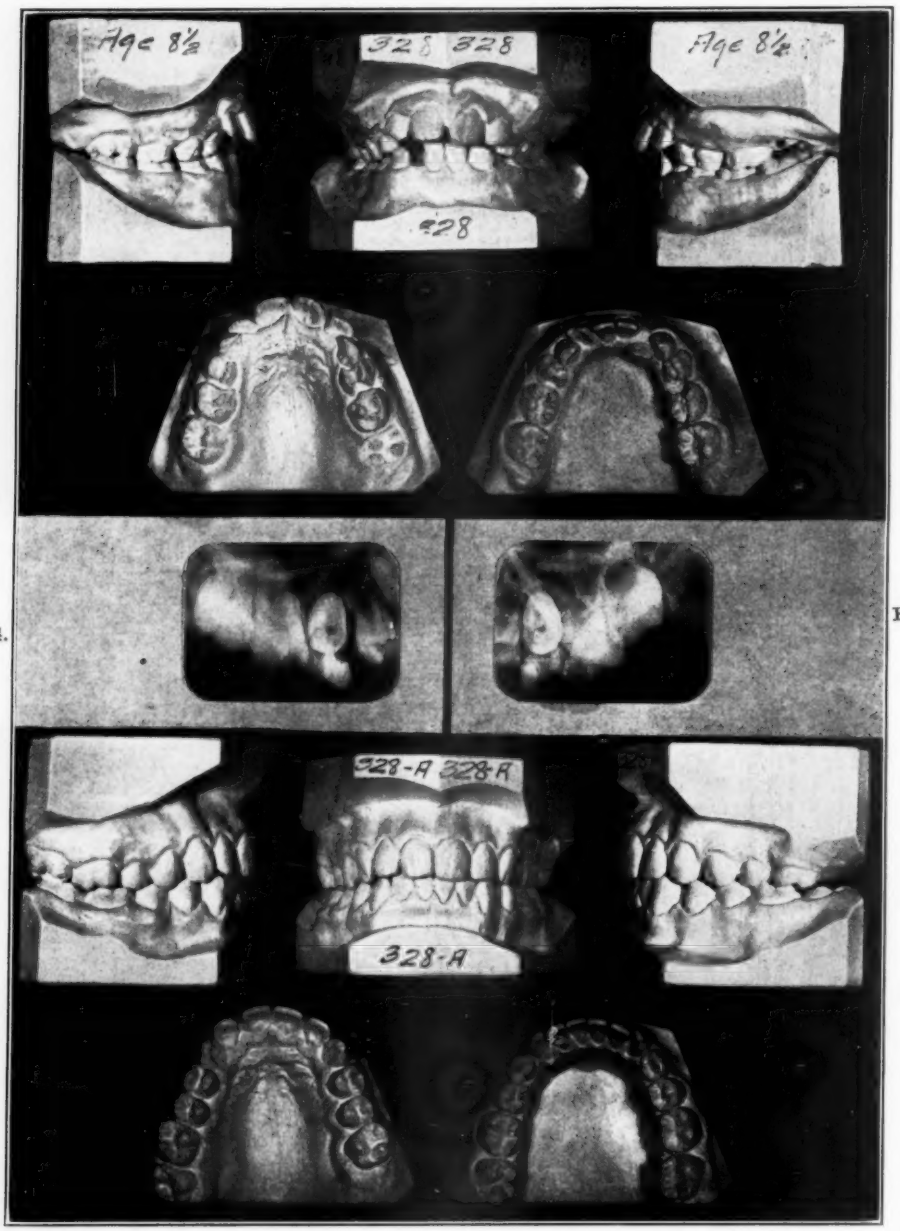

Fig. 4.

Fig. 5.

Fig. 6.

the career of the first molar was ended—not, however, without a struggle. The oral surgeon, a skillful operator, reported unusual difficulty in removing the tooth. The second molar was then moved forward to the position of the first, with the result shown in Fig. 6.

Case 2 was that of a girl 9 years of age, presenting for treatment in March, 1926. Models of the case, reproduced in Fig. 7, show the right mandibular second deciduous molar apparently impacted between the right mandibular first molar and the right mandibular first deciduous molar. A radiogram of the region is shown in Fig. 8. In this case an auxiliary pin-and-tube appliance was placed on the right mandibular first molar and the right mandibular first deciduous molar, with a lingual arch as the principal mandibular appliance. Space

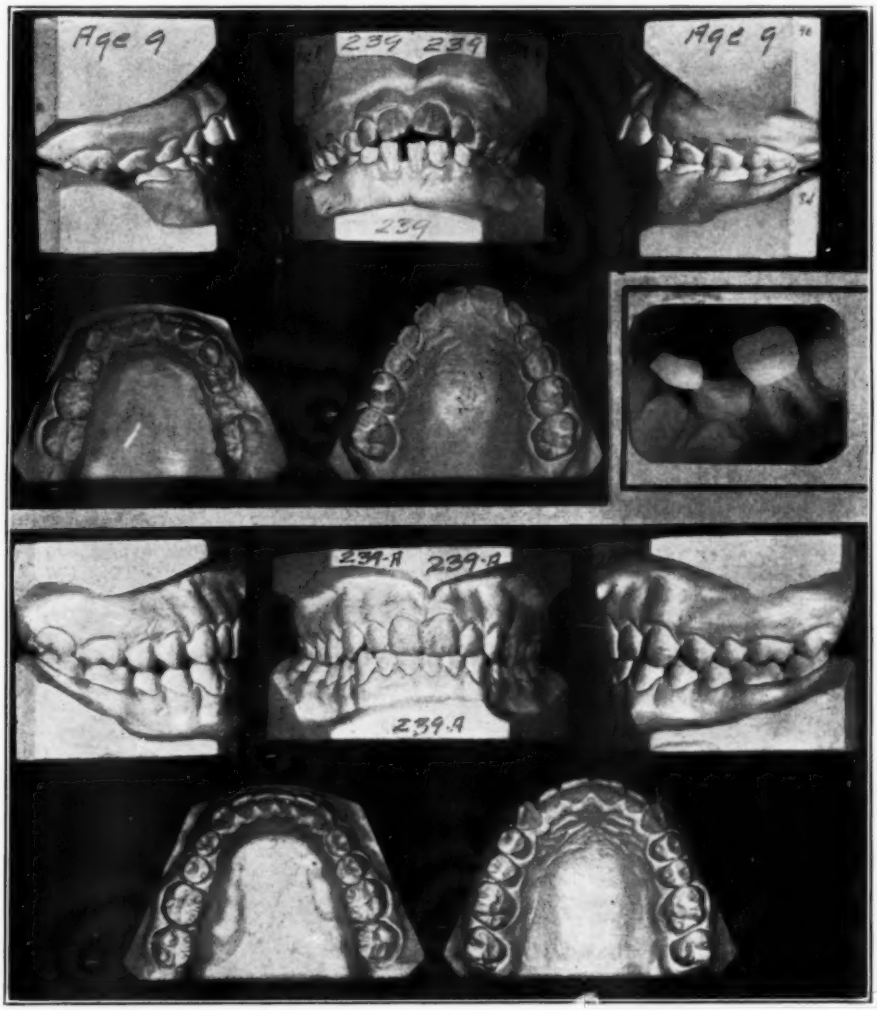

Fig. 7.

Fig. 8.

Fig. 9.

was readily obtained for the right mandibular second deciduous molar, with a comfortable margin to spare on each side. The tooth, however, altered its position not in the slightest degree, and a year following the beginning of treatment the tooth was removed. The succeeding second bicuspid erupted uneventfully, and the treatment yielded the result shown in Fig. 9.

Now the question occurs, was there in either one of these cases a really impacted tooth? In Case 1 the radiograms show hardly any significant difference of position between the left molar and the right molar. That the left molar was prevented from erupting by any physical obstruction is difficult to believe.

In Case 2 the right mandibular first molar appears to be an obstructing factor, but the second deciduous molar should have been in position years before the first permanent molar was anywhere near the erupting stage. So in this case, also, the evidence suggests that the eruption of the tooth was arrested by some factor other than physical obstruction.

In an endeavor to explain the failure of these teeth either to erupt or to respond to orthodontic stimulation it may be of some help to review briefly the theory of tooth movement that has been accepted as a result of Oppenheim's experimental findings.

These findings (Fig. 10) showed that changes in positions of teeth occurred as a result of resorption of bone on the side of pressure and formation of new bone on the side of pull, the spicules of new bone being arranged parallel to the direction of the force. On the side of pull, the end of the spicule facing

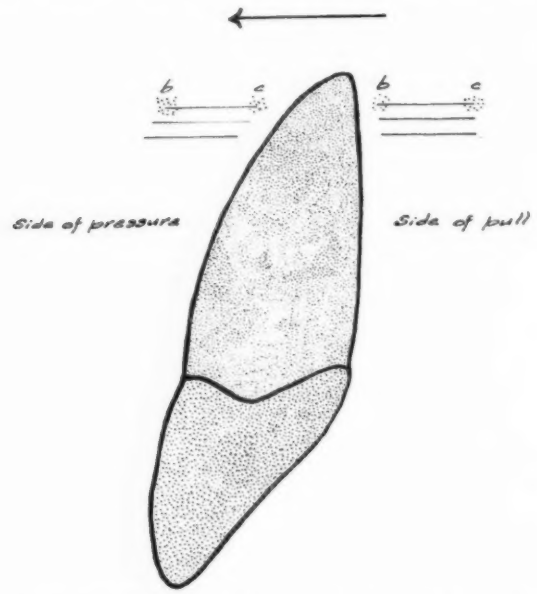

Fig. 10.—Diagrammatic illustration of bone changes under orthodontic force. Arrow indicates direction of force. Horizontal lines opposite root represent spicules of new bone greatly out of proportion. *b*, Osteoblasts; *c*, osteoclasts.

the tooth is beset with osteoblasts, showing new bone formation, while the end of the spicule away from the tooth shows the presence of osteoclasts, indicating bone resorption. Kronfeld explains these bone changes thus: Under pull the fibers of the periodontal membrane become stretched, widening the periodontal space. This widened space the newly forming bone attempts to reduce to normal width. As to the resorption at the end of the spicule away from the tooth, this may be reasoned as due to lack of need on this side of the tooth for a thickened bony plate.

On the side of pressure there are likewise new bone spicules, arranged parallel to the direction of force, but here the spicules show the presence of osteoclasts (resorption) at the end facing the tooth and osteoblasts (new formation) at the end away from the tooth. This new formation at the end of the spicule away from the tooth prevents complete destruction of the labial and

buccal plate, which is thus kept moving more and more toward the labial and buccal. Kronfeld further explains these changes as follows: Under pressure the periodontal membrane becomes compressed, and in an attempt to allow the periodontal membrane to regain its original size the osteoclasts resorb the bone.

These findings regarding tissue changes under orthodontic stresses are introduced here to emphasize the point that the vital factor in bringing about tooth movement is the activity of osteoclasts and osteoblasts. Without these our orthodontic forces are of no avail. Another point of importance concerning osteoclasts and osteoblasts is that these cells have their origin in the periodontal membrane.

Now suppose the stress exerted by the orthodontic appliance upon the tooth becomes excessive. What happens then? The periodontal membrane becomes crushed between the cementum of the tooth on one side and the bone of the alveolus on the other, and its blood vessels become filled with dark masses of coagulated blood. Because of this damage to the periodontal membrane, osteoclasts are not produced, and accordingly bone resorption fails to take place on the side of the alveolus. Consequently, the tooth, instead of moving faster under this increased force, is prevented for a time from moving at all except for the space yielded by the crushed periodontal membrane.

So if an unobstructed tooth fails to move under normal orthodontic stress, we may suspect an absence of osteoclastic and osteoblastic activity. Such a condition would obtain with respect to a tooth in a state of ankylosis, for an ankylosed tooth is united directly to the surrounding bone without any intervening periodontal membrane.

If this reasoning can be substantiated by histologic investigation, it will follow that the teeth which have been defined and described above as pseudoimpactions are nothing more nor less than cases of ankylosis. As such they would belong to the class of submerged teeth.

As to the incidence of pseudoimpactions, in my practice a number of such cases have been encountered which involved the deciduous teeth, yet relatively few compared with the cases of submerged teeth. The case reported above, involving the first permanent molar, is the only one found so far in which the affected tooth was a permanent one.

Regarding treatment of the pseudoimpaction, there is little to say. Inasmuch as the tooth per se is not amenable to orthodontic influence, the matter for decision is whether it is an asset or a hindrance in the position in which it is found. If the latter, there is no choice but to remove it. In the event it is a permanent tooth, the choice then lies between closing the space or providing an artificial substitute.

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DISCUSSION

Dr. Harry Kaplan, Washington, D. C.—The normal process of tooth eruption must be constantly borne in mind when considering the problem of impacted cuspids. There will be fewer failures in treatment if it is coordinated with the normal physiological process. I have selected Kronfeld as my authority on the resorptive process associated with bone and the shedding of deciduous teeth.

Enamel epithelium is organically attached to the crown, which in turn is surrounded by a connective tissue sac. Dr. Erikson has described the radiographic appearance of this soft tissue covering. The permanent tooth proper exerts no resorptive force, but this power rests with the connective tissue sac. The erupting tooth with its lengthening root moves occlusally, and it is not difficult to realize that the pressure exerted on the sac will activate a peripheral layer of osteoclasts. These osteoclasts resorb the hard structures in the path of the erupting tooth, and the process is similar to the resorption of bone in connection with the movement of teeth during orthodontic treatment, also discussed by Dr. Erikson. This resorptive process does not affect the permanent tooth because of the protection of the enamel epithelium.

If for some reason the permanent tooth does not erupt at the proper time, the connective tissue may accentuate its resorptive power by increasing in size at the expense of the surrounding bone (Fig. 3 *C*, *D*). A break in the organic junction between the enamel and the enamel epithelium may result in cyst formation as seen in a dentigerous cyst.

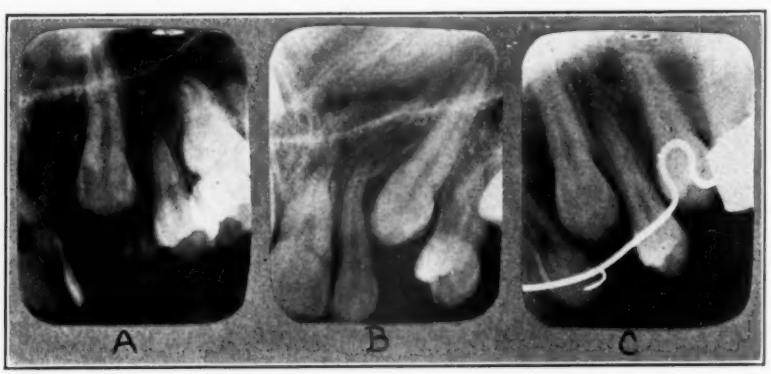

Fig. 1.—*A*, Cuspid is in good position for eruption but space is lacking.
B, Two months later, following removal of deciduous tooth, bone, and sac, with no apparent change.
C, After two months of orthodontic treatment to widen space. Tooth is definitely erupting.

With these facts in mind we should not feel that the removal of the surrounding bone and the connective tissue sac will materially encourage the eruption of a tooth. Nature has provided the erupting tooth with its own excavator, and the efficiency of this has been demonstrated so frequently that it is a result normally to be expected.

I agree with Dr. Erikson that the first step in treatment should be directed toward providing adequate space where that is lacking (Fig. 1). Frequently if the retained tooth is in proper but crowded position, no further treatment will be required. The use of a vulcanite denture with pressure at the point of expected eruption has been demonstrated to facilitate eruption. Very often retained deciduous teeth, supernumerary teeth, or an odontoma may obstruct eruption, and the removal of these interferences without disturbing the connective tissue sac will generally permit normal eruption of the retained tooth (Fig. 2).

After definitely determining by radiograms and clinical examination the exact location of an unerupted cuspid and that surgical intervention is necessary, the following method will prove satisfactory. Often a prominence can be seen in the hard palate lingual to the lateral incisor or lateral and central incisor. An incision through the periosteum about 10 mm. in length is made parallel to the long axis of the crown. The periosteum is retracted on each side of the incision until the bone overlying the crown is well exposed. Generally

Fig. 2.—*A*, Supernumerary tooth preventing eruption.
B, Several months later showing eruption of tooth.
C, Retained deciduous tooth apparently preventing eruption.
D, Four years following removal of deciduous tooth, overlying bone and connective tissue sac. Overlooked supernumerary tooth (indicated with mark) prevented eruption.

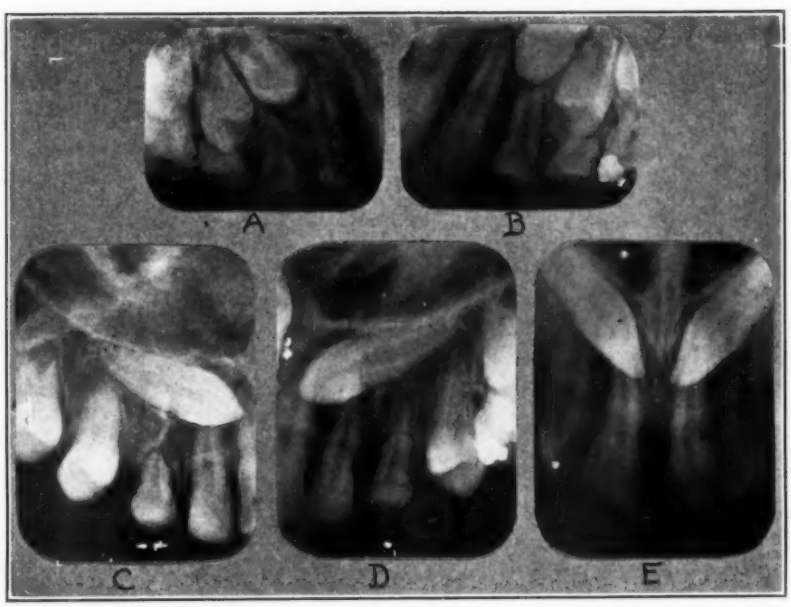

Fig. 3.—*A*, *B*, Cuspids in good position at early age.
C, *D*, Cuspids diverted for no apparent reason. Note enlarged connective tissue sac.
E, Exposure packed until collapse of surrounding tissue brought teeth into mouth. One exposure at a time in such a case.

hand pressure chisels and curettes will readily remove the required amount of bone. The use of the mallet, however, may be necessary. The connective tissue sac may then be totally or partially removed, depending upon its proximity to surrounding roots. If the crown is in close apposition to the roots of the adjacent teeth, no attempt is made to remove the sac between them. The exposed area is packed with iodoform gauze impregnated with vaseline, and it will be found that this wound, created by a straight incision, will become an elliptical opening in a short period of time. The removal of a circle of tissue does not appear to be necessary, and by avoiding this procedure the danger of hemorrhage and of interference with the blood supply is minimized. The packing may be changed in several days without discomfort, and it will be found that a satisfactory exposure has been made for the application of a pin, casting, or twisted wire attached by the use of cement. The aperture should be kept patent until through either the collapse of the surrounding tissue (Fig. 3) or the eruption of the tooth the crown is sufficiently exposed.

If the exposure is allowed to heal with the thought in mind that the removal of bone and connective tissue sac will induce the eruption of the tooth, the space formerly occupied by the absorbent organ may fill in with bone and make further operative procedure necessary (Fig. 4).

It is frequently determined that the actual removal of an impacted cuspid is advisable. The orthodontist should ordinarily determine when such a procedure is required.

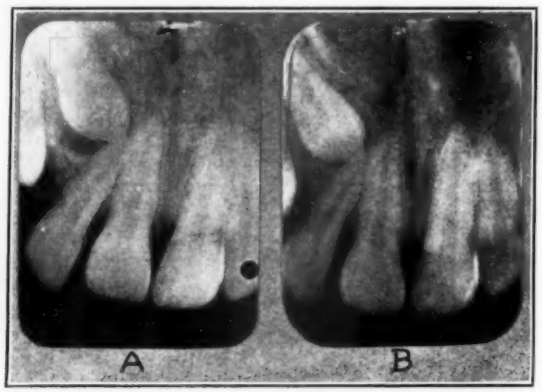

Fig. 4.—*A*, Impacted cuspid with enlarged sac. *B*, Wound allowed to heal following exposure. Note filling of sac space with bone.

Regarding the proper time for the removal of unerupted third molars that may interfere with orthodontic treatment, an early age has been suggested. Oral surgeons have suggested that by making an incision and retracting the soft tissues, a small opening can be made in the bone and the soft tooth bud removed with curettes. Undoubtedly the tooth bud can be removed with curettes, but in my hands an operation on a child of 12 years is extremely difficult because of insufficient space distal to the second molar (Fig. 5*A*). At the age of 13, when the crown is partly formed, its removal would appear to be simple but this does not prove to be the case (Fig. 5*B*). After the tooth crown is complete and its location suggests impaction, one who has not performed the operation might suggest that before the roots have formed would be an ideal time to remove the tooth. As a matter of fact, thirty to forty-five minutes should be allowed for its removal. The tooth resists splitting, rotates as a ball in a socket and requires the removal of a large amount of bone for delivery (Fig. 5*C*). The trauma induced often results in extreme swelling and much postoperative pain. A tooth equally impacted but with complete or almost completely formed roots is the least difficult to remove. It would not be unusual to remove a tooth of this type in about ten minutes (Fig. 5*D*). The difficulty of extraction is not the prime factor to be considered, and we are well aware that a large amount of bone removed overlying an unerupted third molar will be replaced with new bone, but the extraction should be delayed if the tooth is not exerting undue pressure. The orthodontist should be the authority determining these factors.

We have all seen third molars with all the radiographic appearances of impaction erupt satisfactorily, but often the eruption is at the expense of the arch, and undue delay in removing such teeth should be avoided (Fig. 5*E*, *F*). The crowding of anterior teeth caused by the eruption of third molars has been observed in treated and untreated cases in the twenties.

My conclusions regarding the problem of unerupted cuspids beyond normal age are as follows:

1. Sufficient space should be provided first for the reception of the tooth.

2. The removal of retained deciduous teeth, supernumerary teeth, and odontomas will often allow the permanent tooth to erupt without further interference.

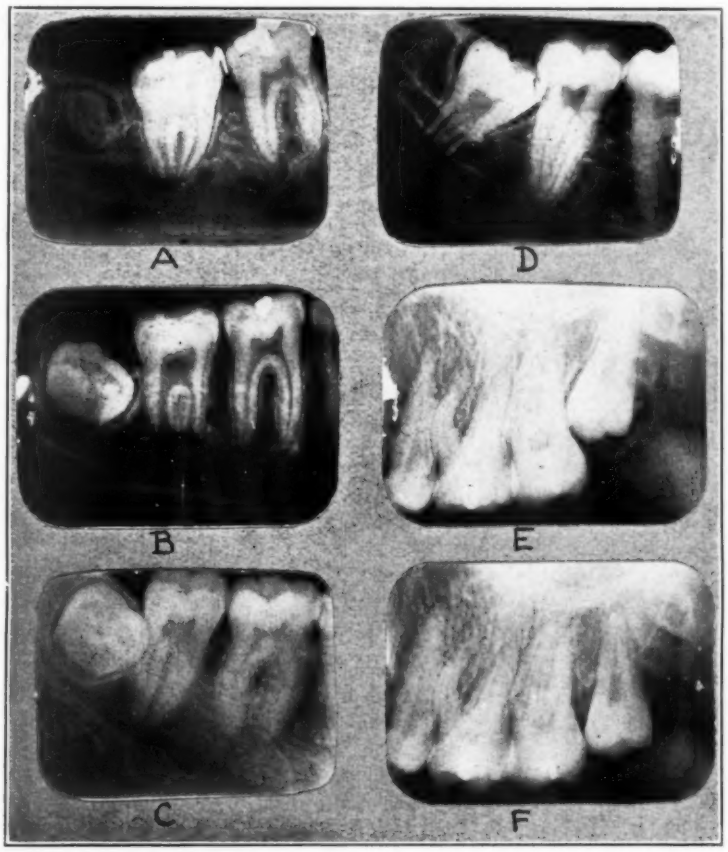

Fig. 5.—*A*, Soft tooth bud.
B, Crown partly formed.
C, Suggested impaction before root formation.
D, Roots almost completely formed and easiest time for removal.
E, Apparent impaction.
F, One year later. Tooth has erupted.

3. The removal of bone overlying the crown and the connective tissue sac does not aid materially in hastening eruption unless the exposure is maintained until an orthodontic attachment is secured or until the crown has partially erupted.

4. No extensive operation is necessary, and it is often inadvisable to remove all the connective tissue sac.

5. If exposure is on the lingual approaching the median line, only one at a time should be attempted to avoid possible interference with the blood supply and subsequent sloughing.

Regarding unerupted third molars for ease of removal, I would select the ages of 17 and 18.

PRINCIPLES AND OBLIGATIONS OF ORTHODONTIC EDUCATION

B. E. Lischer, D.M.D., St. Louis, Mo.

WITH the founding of the first dental college nearly a century ago dental education adopted scientific standards for securing its objectives and discredited empirical methods for solving its problems. During all the years prior to 1840 and for three-fourths of this period of formal dental education, dentistry was generally taught and practiced as a skilled craft, to minister to man's comfort and to improve his looks.

Until the middle of the last century universities largely confined their instruction to medicine, law, theology, and the liberal arts. With the rapid growth of our state universities most of them responded to public demands by enlarging their curriculums and adding other fields of knowledge. Because of this departure from ancient custom universities were severely criticized. Nearly all the newly added fields of study "had to fight for their place in the sun. Each was opposed as either trivial, or irrelevant, or menacing to the nonutilitarian ideals of pure learning."

Courses of study in public health, dentistry, nursing, pharmacy, education in all its branches, and many other subjects are now offered in the universities, for it has been shown that university schools generally provide a superior apprenticeship for these newer professions. The educational requirements of these vocations are too advanced and expensive for proprietary schools.

Universities are acknowledged as some of the most useful institutions established by man, for it is recognized that education is one of the most important tasks to which man may devote his talents. Education is in fact the chief instrument by which each generation hands on accumulated knowledge to its successors. By common consent, universities thus "represent the embodiment in each nation of its highest ideals of scholarship."

When Harvard University established its School of Dentistry in 1867, another fundamental policy of education for dentists was inaugurated.

The advancement in recent decades of the sciences of bacteriology and pathology, of biochemistry and roentgenology, has supplied us with vastly improved methods for the critical study of oral diseases, of their relationships to the general health of the body, and of systemic diseases to the teeth. We have toiled laboriously in establishing a scientific foundation for dental practice and at long last elevated it to the honorable status of a health profession. The noble vision of the founders of the first dental college and of those far-seeing pioneers who urged Harvard University to establish a School of Dentistry has become a "lamp of our life, burning with a purer flame."

Orthodontics is one of the newer branches of dentistry, one whose educational requisites have not been subjected to exacting scientific scrutiny or pro-

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vided with adequate facilities. It originated in a hit-or-miss fashion as a branch of mechanical dentistry and is still hindered in its development by a too rigid conformity to the concepts of reparative dentistry.

The Committee on Education of the American Association of Orthodontists appreciates the Association's interest in the future of orthodontic education. Each of its annual reports has dealt with a definite phase of our educational problems. This year we believe it would be useful to consider these problems in a general way and to discuss principles and obligations. Although economic trends since 1930 have well-nigh overwhelmed our interest in education, we must continue to create ideals for the profession we represent and adapt ourselves to them.

In a recent number of *Science* (February 18, 1938) Dr. William E. Wickenden, president of the Case School of Applied Science, says:

"Getting adjusted means taking stock of one's limitations calmly and coming to terms with them. Limitations of nature one must accept without bitterness or envy. . . . Limitations resulting merely from education or experience one may strive hopefully to overcome, and especially not to repeat the errors of his own rearing in the children who are to come after him."

Dental anomalies have been recognized and treated for twenty centuries, but it is only in the last fifty years that fairly adequate methods of treatment have been employed. Progress in this division of dental service was very meager until professional apathy and lay prejudices were in part overcome by the admirable enthusiasm and unusual ability of a few dentists.

Notwithstanding our enlarged comprehension of the growth and development of the human denture and the many recent improvements in the treatment of its anomalies, orthodontic service for children is not so widely employed as the injurious effects of neglect of malformations justify. Many trustworthy investigations have shown that the frequency of oral deformaties averages 50 per cent, of which probably not more than 1 per cent receive the necessary treatment. Total mutilations of the denture, for which prosthetic dentistry has developed such efficient service and for which all dental schools have organized adequate courses of instruction, do not reach this high percentage of frequency until the sixth decade of life.

This anomalous educational situation should not be attributed to inherent difficulties of orthodontic therapy, for similar difficulties are encountered in every division of clinical dentistry and medicine, but to the tardy development of our knowledge of the incidence, etiology, diagnosis and prognosis of dental anomalies, and to the general unscientific status of dentistry, which is only beginning to emerge from its arts and crafts epoch.

To be more specific about the faults of undergraduate instruction, we call attention to the fact that other clinical divisions in a dental school usually are better equipped and have a larger staff than the orthodontic division; they are allowed considerably more time in the schedule and are accepted as more essential. Oral diseases and mutilations still have a prior claim over anomalies, notwithstanding that prevention of the latter would materially reduce the incidence of the former. Although it is admitted that oral malformations are

the result of pathological development, most practitioners accept anomalies as permanent conditions. Diseases of the mouth, on the other hand, are accepted as processes, ever changing, like caries, erosion and paradentosis. Just as the physician continues to ignore the mouth and teeth, so the dentist frequently fails to recognize anomalies and their consequences.

But, we ask, is not this due to inadequate education? Is not this inequality in departmental organization the result of a widespread misunderstanding of the purpose and aim of dentistry? All too often preventive service remains an ideal instead of developing into a mode of practice. Too many of our efforts are still directed to the repair of lesions *after* diseases have damaged the oral tissues. The new dentistry, which seeks to prevent diseases and which is concerned about anomalies, finds it difficult to go forward. As a group we ought to be more mindful of our responsibilities and contribute more generously to the solution of these problems.

We must learn to overcome the influence of tradition and abandon the indifference to actual conditions which has so long retarded the development of orthodontics. T. H. Huxley once said, "there is nothing more tragic than the murder of a big theory by a little fact." But he hastened to add that "nothing is more surprising than the way in which a theory will continue to live long after its brains are knocked out."

The changes required to reform inadequate instruction in orthodontics must begin in the undergraduate curriculum. The American Association of Dental Schools is keenly aware of the problems which orthodontic education presents. We believe it would welcome the cooperation of the American Association of Orthodontists in periodically reviewing courses of study in orthodontics. Such courses must provide (a) instruction for undergraduates, (b) graduate courses for the training of specialists, and (c) special postgraduate courses for improving the proficiency of established specialists. Chapter XXIV, parts of Chapters III and XXXV of the report of the Curriculum Survey Committee of the American Association of Dental Schools (1935) mark a very definite advance in our educational progress.

Graduate courses for the competent training of specialists are generally regarded as necessary, and, since dental education has gained full university status, the profession can no longer afford to support short, inadequate and privately conducted training courses, which usually consist of bench work. In complying with academic requisites for graduate work, such as have long been set up for all the other fields of knowledge, university dental schools are bound to build their graduate courses on sound, obligatory undergraduate work and acknowledge the inconsistency of a former widely prevalent and educationally untenable concept; namely, that all orthodontic education is graduate education.

The general practitioner of dentistry has always been and will continue to be the first to be entrusted with the care of a child's teeth; hence it follows that he is vested with considerable responsibility, and that he should receive adequate instruction in the basic principles of orthodontic service during his undergraduate course. Much has been written on this subject and, in the present

instance, we can only sketch the essentials of that minimum instruction which every dental student should get. But before presenting an outline of this minimum instruction and indicating the number of courses by which effectual training of the undergraduate can be realized, we beg to call your attention to additional reasons why we firmly believe that these educational matters are a major responsibility of this Association.

Dentistry is widely recognized as a profession, which implies that it is an occupation which demands a liberal education. In a lecture on Professions, Dr. L. A. Maverick, of the department of economics of the University of California in Los Angeles, declared: "An occupation cannot easily elevate itself to the status of a profession. Not only must it set up internal standards, but before it may be termed a profession it must command general recognition. The older professions meet both these tests, discipline within their ranks and recognition of the public. Law, the ministry, teaching, and medicine are the established professions. But other occupations are developing the status of professions, among them being engineering, social service, architecture, journalism, research, the less rigorously trained branches of medicine, and certain vocations which definitely serve business and industry, as accounting, auditing, and labor management."

Dr. Maverick doubtless had dentistry in mind when he included "the less rigorously trained branches of medicine."

In a memorable address delivered in 1914, Professor G. H. Palmer, of Harvard University, said: "The wares of doctors and lawyers are not commodities of the market. The compensation of the professional man is measured by his inner outgo and not like the tradesman's by his external income."

In his *Social Principles of Education,* Professor G. H. Betts says, "The professional pursuits belong to a relatively advanced stage of social development. They have their origin in the necessity for meeting crises in experience."

Members of a profession whose training and education are superior are recognized as leaders in their chosen fields. The educational aim of every profession is to avoid a training which is narrow; hence the universities were asked to assume control and supervision of the education of professional groups.

The Social Science Research Council, in a recent Bulletin (No. 39, 1937), published a valuable study of the professions and described the nine criteria which characterize a profession as follows:

"1. A profession involves personal service.
2. This personal service is practical in the sense of being an art.
3. There is an intellectual character to this service with considerable self-direction and individual responsibility.
4. The service is based on science and learning.
5. It has a technique that is transmissible through an orderly and specialized educational discipline.
6. There is usually payment for skilled service.
7. Members of a profession are a brotherhood.
8. There is an increasingly altruistic motivation and devotion to the well-being of those served and of the larger community.
9. This sense of social responsibility is embodied in a code of ethics."

Without further citations of the credentials of a profession, we believe dentistry *is* a profession. We believe further that dentistry and the branch of it which this Association represents are obliged to maintain a progressive attitude toward educational principles and responsibilities. To reach our objectives and to fulfill the promise of orthodontics we, therefore, must continue to cultivate professional ideals and perfect our educational methods.

In presenting this general report on principles and obligations, we include the following outline of the essentials of that minimum training and instruction which every undergraduate dental student should acquire.

1. He should learn to appreciate the value of a normal, healthy denture for the child as well as for the adult.

Clinical orthodontics can contribute many important data to the student's understanding of growth, form, symmetry and function.

2. He should learn how to supervise and control development of a child's denture, and to understand its dentofacial relationships.

An orthodontic clinic staff can show the beginning of many deviations in growth which frequently are overlooked, and it is best qualified to explain and provide the preventive or remedial measures which may be required.

3. He should be taught scientific methods for the study of facial form, so that he will be able instantly to detect any malformations of its features which are caused by anomalies of dentition.

Even if the student later elects prosthetics as his major field of interest, he should nevertheless be able to recognize deformities of partial and complete mutilations which originally were anomalous dentures.

4. He should be competent to diagnose and prognose every kind of dental anomaly.

Competency in diagnosis and prognosis will arouse his interest in the pathogenesis of anomalies and stimulate his desire to prevent abnormal developments in the young.

5. Since many communities do not support the specialist, the general practitioner should be taught how to treat simple, *eugnathic* anomalies and thus help to reduce the incidence of extreme anomalies.

Eugnathic anomalies present malposition of one or more teeth without malformation of the supporting jaws. These are very common in children with mixed dentures, and relatively simple methods suffice for their treatment.

6. He should be taught frankly to admit any shortcomings of his knowledge and his inability to treat *dysgnathic* anomalies.

Dysgnathic anomalies not only exhibit malocclusion of several teeth, but they present malformations of the jaws and facial features. These should always be placed early in the care of a specialist. Ability to treat dysgnathic anomalies cannot be acquired in the undergraduate courses usually offered in dental schools, nor in the time required for the courses enumerated below. To provide sufficient time in the four years' course a separate curriculum, such as has been set up at the University of California since 1930, is necessary.

7. Lastly, the undergraduate must be taught to evaluate new practices and equipment which are frequently proposed in the name of progress, but which do not always measure up to requirements. He must learn that even the profes-

sions are not entirely free from fads, and that not all procedures offered in the fair name of science are acceptable.

Beginning with the session of 1937-1938, all dental schools in the United States adopted a minimum entrance requirement of two years, or 60 units, of liberal arts work in a recognized university or college. The present number of freshman students in the dental schools is, therefore, not so large as formerly, but all of them are more mature and better prepared for the study of dentistry.

At a meeting of the American Association of Dental Schools held in Chicago in 1934, Dean Addison Hibbard, of Northwestern University, justified this higher entrance requirement, which was then being seriously discussed, by saying:

"Look about you among the practicing dentists or the practicing physicians or the practicing engineers, those men whom you know are failures in those fields, or at least near failures. Are they unsuccessful because they do not know their dentistry or their medicine or, in the case of the engineers, perhaps their stresses; or more frequently are they unsuccessful because they are intolerant, because they lack initiative, because they are perhaps unimaginative, because they have in brief so little *savoir-vivre* perhaps? Are not these the things, among others, which you expect a liberal background to give these men?"

Now that the American Association of Dental Schools has adopted this higher entrance requirement and made certain of a broader background for every student of dentistry, every university school is determined to extricate itself from the anomalous educational position it has hitherto occupied, namely, a position between a technical college and a professional school.

For dentistry to claim "its full and rightful place in the social order" it is necessary to "develop its teaching and its research on a parallel with medicine. Dentistry in the field of education must become a university discipline. Dentistry as a university discipline presupposes emphasis on the intellectual content of the curriculum, the study of abstract knowledge underlying concrete problems of treatment."

We believe the American Association of Orthodontists should lead the way of orthodontic education, since it cannot discharge its obligations nor attain its objectives if it declines to cooperate with other constructive groups that strive to advance the aims of dentistry in the field of education. With these principles and tendencies in mind, we recommend the following courses in orthodontics for all undergraduate dental students, to provide the minimum instruction outlined above, and the necessary prerequisites for pursuing graduate study:

1. *Principles of orthodontics.* An illustrated didactic course, 32 hours, credit 2 units.

2. *Essentials of mechanotherapy.* (a) A lecture demonstration course, 32 hours, credit 2 units; (b) technical laboratory course, 92 hours, credit 2 units.

3. *Introduction to clinical orthodontics.* (a) Lecture demonstration course, 16 hours, credit 1 unit; (b) clinic exercises in case history taking, diagnostic data, diagnosis and prognosis, 48 hours, 1 unit.

4. *Clinical orthodontics.* (a) An obligatory clinic course, 140 hours, credit 4 units. This course consists almost entirely of treatments for eugnathic anomalies, in all the various stages of treatment. A limited number of dysgnathic anomalies can be presented to show the difficulties encountered in treating the latter. All the patients are treated by the staff, and the students are admitted in sections, which can be rotated throughout the course, so that each student will have an opportunity to attend the conferences of each staff instructor. (b) An elective course for qualified seniors, 140 hours, credit 4 units, is recommended. Students admitted to this course may be required to assist in the treatment of patients, under the guidance of the instructors. If the clinic conferences are well planned and the instructors make special assignments, the attending students are encouraged to take up graduate study.

In summarizing these courses we note that the obligatory instruction requires 360 hours and yields 12 units of credit. Since none of the instruction offered in these courses is of graduate grade, it is recommended that applicants for graduate study be required to present a minimum credit of 12 units as a prerequisite for graduate status. By graduate work we mean advanced work, the knowledge, training and skill required for the treatment of dysgnathic anomalies, the preparation intended for the specialist. Graduate courses demand separate educational organization and standards, offer opportunities for original research, require the preparation of a thesis, and confer advanced degrees. The addition of the elective course increases the total hours to 500 and the units of credit to 16.

Since progress is inseparably associated with the "right application of knowledge and the right use of power," we urge allegiance to the principles we have outlined, recommend continuance of the study of our educational problems, and our support to all constructive efforts which aim to raise the status of orthodontic education.

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PRELIMINARY STUDY OF ORTHODONTIC RESULTS AS REVEALED BY ROENTGENOGRAPHIC CEPHALOMETRIC RECORDS

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PROFILE roentgenographs taken under the standardized conditions made possible through the use of a cephalometer† are not new, but, since first advocated by Broadbent,[1] have been used for growth studies (Todd, Broadbent and associates at Western Reserve; Washburn, Humphries, Waldo and McDowell of the Child Research Council in Denver; Margolis and associates at Harvard; Brodie at Illinois; and Spiedel and Higley at Iowa) and more recently for orthodontic diagnosis and as a means of demonstrating the results of orthodontic therapy by Fisk,[2] De Coster,[3] Korkhaus,[4] and others, as well as those previously mentioned.

Approximately seven years ago Speidel,[5] under the Division of Graduate Orthodontics, produced the first standardized profile roentgenographs made at the State University of Iowa. However, because of the error introduced by changes in the design and location of the equipment, the early roentgenographs were not considered comparable with those taken after the fall of 1935, when a new equipment was permanently installed.[6] This will explain why the cases to be presented have been so recently treated and why results after several years of retention are not included.

The profile roentgenograph, it has been said, combines all the known methods of determining the symptoms of dentofacial deformity and most clearly depicts the relative anteroposterior and vertical changes in the osseous and soft tissue structures resulting from treatment. Not only are gross dimensional changes, such as an increase in length or depth of the lower third of the face, easily recognized, but also proportional changes within a given dimension such as movement of individual teeth or tooth units may be investigated. For example, Taylor[7] questions whether distal mass movement is possible. By taking roentgenographs every two months during the period of attempted distal mass movement it was demonstrated by Gruber[8] and Slavin[9] that some movement of the teeth through the bone was accomplished.

Nelson[10] recently reported a case in which she had used cephalometric roentgenographs to show results. Although the appliance was activated to produce distal mass movement, after fifteen months of treatment and retention the maxillary molar was shown to be actually slightly mesial to its original position. She states: "We assume that we are successful in this attempt at distal move-

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†Technically the cephalometer is a head-holder with a measuring device attached, but the term is often used to refer to any head-holding equipment.

ment, and that function carried the denture forward into its present correct relation to the cranium. Only a cephalometric x-ray made immediately after completion of the distal tipping, compared with the two we have, would show whether or not we actually moved the upper molar a full tooth distal to its original position."

If, through the use of the cephalometric roentgenograph, it could be demonstrated whether or not mass distal and other tooth movements were possible, such records would seem indispensable in determining the value of present methods of treatment. It has been interesting to note the number of papers presented during the last few years on orthodontic failures or relapses after treatment. Perhaps the analysis made possible through the use of the cephalometric records may go far in establishing the reason for such failures.

Korkhaus[11] in his enthusiasm over the use of these roentgenographs makes the following comments: "Teleroentgenographs permit a much deeper knowledge and present further great and unexplored possibilities. This method gives undistorted pictures with the finest reproduction of the soft parts of the profile and the facial bones at the same time. They show all the essential details of the structures and composition of the facial skull, all connections between the alveolar process and the jaw, the form of the jaw angle, etc. This technique affords an unexpected insight into the nature of pathologic development, and also enables us to follow the course of development and the consequences of our therapeutic endeavors, so that teleroentgenography will become the most important instrument in orthodontia, and undoubtedly the best method of determining maxillofacial relations."

McCoy[12] states: "Any comprehensive plan (of diagnosis) must differentiate between all the dependent structures of the facial ensemble, with an effort to determine, as definitely as possible, the number, nature, and extent of all parts contributing to the anomaly." It must be remembered, as demonstrated by De Coster,[3] that an abnormal development of the cranium may be an important contributor to a dentofacial anomaly, and at present the cephalometric roentgenograph is the best means of recording the external and internal cranial development.

McCoy continues: "The method of recording such anomalies assumes real importance, with the factor of standardization being not only advantageous but absolutely essential. Whatever the plan employed, it must be adaptable to routine practice procedure, if the clinical results of a large number of cases are to be made available as evidence." Waldo,[13] in a paper on orthodontic research, concludes his remarks on the cephalometric roentgenographs as follows: "I know of no method of equal value for the study of growth changes in this region, and I hope it may one day be available for use in orthodontic practice."

Since the equipment used in the production of the records to be shown answers the requirement of standardization, is not bulky, and is comparatively inexpensive, it is believed that it is easily adaptable to an orthodontic practice.[6] However, any equipment that can be standardized may be used. The important

thing, if a clear understanding of etiology and of what happens during orthodontic treatment is to be gained, is to have enough operators using the technique to increase the volume of known results of orthodontic therapy and to check each other's findings.

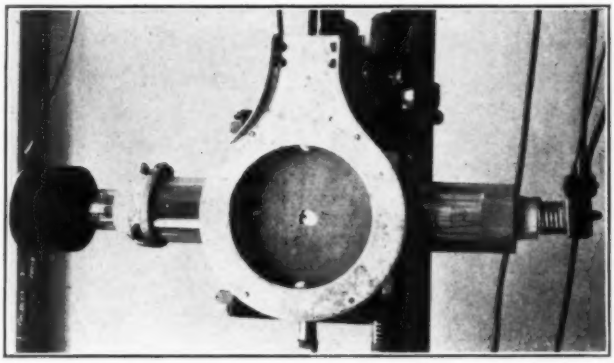


Fig. 1.—Lead diaphragm with a small aperture positioned in front of the tube. The small black speck indicates the midcentral ray.

Fig. 2.—Profile roentgenograph revealing soft tissue profile produced by correct positioning of the lead diaphragm.

As the technique of producing standardized cephalometric roentgenographs has been discussed in the literature, it is probably well known and will, therefore, not be included at this time. Of interest, however, may be the method employed in this technique to secure a good reproduction of the soft parts of the profile without sacrificing the detail of the osseous structures. To do this a

lead diaphragm with a small aperture is positioned directly in front of the tube so that the anterior edge of the aperture is quite near the path of the midcentral ray (Fig. 1). Considerable accuracy is needed in the original positioning of this diaphragm, but, when correctly oriented, the exposure of the soft tissue profile is reduced, while that for the rest of the head remains as usual, with the result shown in Fig. 2.

After a cephalometric roentgenograph has been produced, the next thing is to interpret it. A thorough knowledge of the osseous anatomy of the entire skull is a prerequisite to ease in interpretation, but of equal importance is the

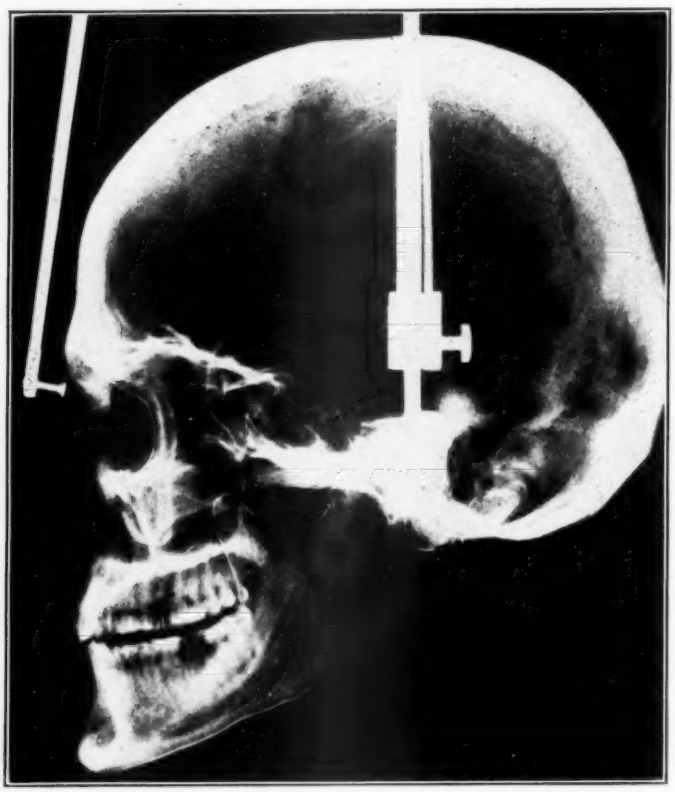


Fig. 3.—Profile roentgenogram of skull with parts outlined with wire to indicate important structures and landmarks.

ability to decide what positions the shadows of the various parts will assume in order to be able to differentiate between those of the left and those of the right side.

As an aid in such differentiation of parts it has been found convenient to have at hand the profile roentgenograph of an almost perfect skull which has been wired to bring out some important landmarks (Fig. 3). (The mandible of this skull has retained its correct relationship to the cranium through a mummification of the muscles, ligaments, and capsule of the joint.) The parts wired are all on the left side, or that next to the film, and include outlines of the bony orbit to the lowest point (orbital point), the lower border and ramus of the mandible, the tip of the mastoid, and the condyle of the occipital bone. There are also vertical wires indicating the mesial and distal of the maxillary

first molar, the prominence of the buccal cusp of this tooth, and the buccal groove of the mandibular first molar.

In the technique used herein the midcentral ray passes through the center of the ear rods. Therefore, if below this level, the shadows of the parts of the facial skull nearest the film will hold an upward and backward relationship to those of the opposite side (as the teeth, mandible, and root of zygoma or key ridge); if on the same level, a backward relation (as the orbital point); and if above this level, a downward and backward relation (as the bony orbit). Note that the wire outlining the mandible shows the lower border of the side nearest the film to be above that of the opposite side, but the lower borders cross close to the gonial angle so that the posterior border of the ramus of the near side is the more posterior of the two.

After the roentgenograph has been correctly interpreted, it is traced. The tracing is done on Kodapak 88 regular (suggested by McDowell[14]), a high grade cellophane which is transparent and waterproof, does not change shape, takes India ink readily, and which, when adapted with the fingers, adheres to the film or glass of the tracing table. Any number of tracings may be superimposed and read with ease.

In order to superimpose correctly the tracings of the roentgenographs taken at intervals and thus determine the changes resulting from treatment, it is necessary to choose some method of orientation that will permit selection of points removed from the area of change and will, at the same time, take into account natural growth changes. McDowell[14] and Margolis[15] are doing interesting work in an effort to determine the best method for such orientation. In these studies, however, we have continued to use the registration point and cranial base line used by Broadbent[1] for such superimposition of tracings. While considerable change may occur in the facial structures through normal growth or as a result of orthodontic treatment, little or no change occurs in the cranium during the age when most orthodontic cases are treated (nine to fourteen) because its growth is almost complete at that time. Therefore, the cranial structures will often exactly superimpose, in which case no method of orientation is needed. When this is true, the changes noted in the facial area cannot be doubted.

Although this discussion is primarily concerned with the value of cephalometric roentgenographs and the results of treatment revealed by them, it is not the intention to detract from the value of other records. As a routine procedure a complete case history, full intraoral and temporomandibular roentgenographs, gnathostatic casts, and standardized photographs are also included in the records. However, in the following presentation of cases in order to conserve space, records other than the cephalometric roentgenographs will be omitted. Since photographs do not do justice to roentgenographs, superimposed tracings of them will be used to reveal the results of treatment.

Eight cases have been selected, all of which were, when first examined, typically Class II Division 1 (Angle) or total mandibular retroversions (Simon). All cases, when the most recent records were taken, revealed an improved facial contour, and the changes produced in the mesiodistal relationships of the teeth

and the contour of the dental arches seemed entirely satisfactory, at least as evidenced by the usual oral examination and as reproduced in the casts. The results of treatment, however, as revealed by the cephalometric roentgenograph may be interesting if not, in some instances, alarming.

The first two cases are of girls sixteen years of age. The mandibles were of good size, and the patients had, by the time mechanical treatment was instituted, eliminated most of the appearance of a deficient mandible through their own efforts to maintain it in a forward position. Neither patient can, at present, retract the mandible more than can a normal individual. The vertical and anteroposterior changes after two years of treatment and retention as shown in Figs. 4 and 5 are: no measurable change in the cranium, mandible or mandibular angle; level of occlusal plane lowered, especially anteriorly as the

Fig. 4.

Fig. 5.

Figs. 4 and 5.—Superimposed tracings of profile roentgenographs. Broken line before treatment; solid line after treatment.

maxillary anterior teeth were carried downward and tipped lingually; maxillary molars moved slightly distal to original position; mandible carried downward and backward increasing the vertical dimension of the lower third of the face; mandibular anterior teeth and immediate supporting structures tipped labially and all mandibular posterior teeth mesial to their former positions; soft tissue profile improved, as upper lip is depressed, curl of lower lip is reduced, and prominence of soft tissue chin point is improved, since lowered to conform more closely to the bony chin point; mesiodistal relation and inclination of posterior teeth corrected; overjet and overbite brought within the range of the normal; mentalis muscle well developed.

The next two cases (Figs. 6 and 7) of girls eleven and twelve years of age demonstrate results similar to those in Figs. 4 and 5, except that there has been some downward and forward growth of the cranium and upper face, as might

be expected at this age. There has also been an increase in length of the body of the mandible as well as a more pronounced downward and backward swing corresponding to a similar swing of the maxillary anterior teeth. It would seem as though there had been a heightening of the ramus, but since the tracings of the ramus before and after treatment exactly superimpose, this appearance is evidently due to the downward and backward swing of the mandible, which would naturally lower the mandibular angle. Regardless of this swing of the mandible the bony chin point has remained in approximately the same forward position, evidently due to the increased length of the mandible.

Figs. 8 and 9*A*, show results in a boy of eleven and a girl of twelve which, after two years of treatment and retention, show that there has been the normal downward and forward growth of the entire facial skull as described by Broadbent.[1] An increase in both length and height of the mandible has occurred,

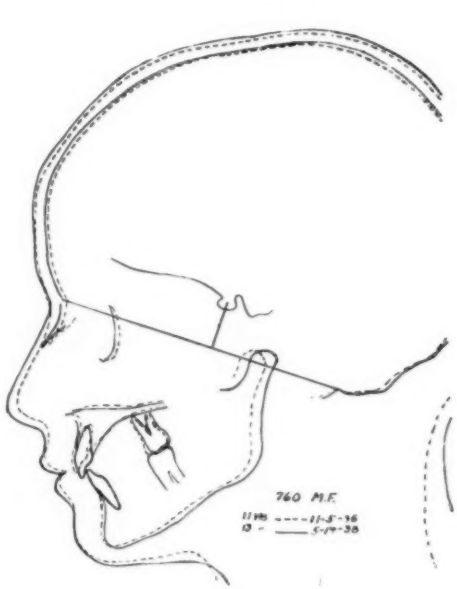


Fig. 6.

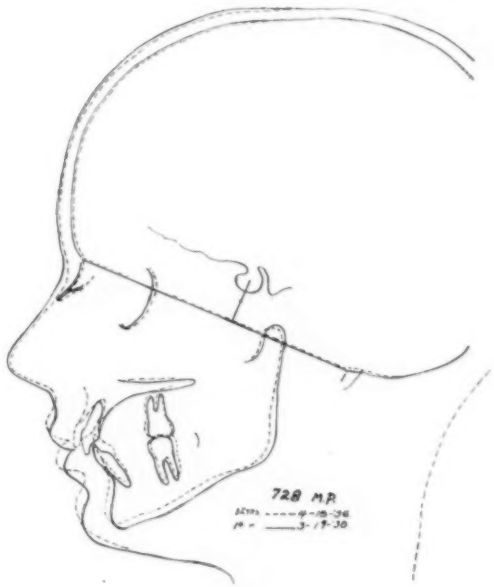


Fig. 7.

Figs. 6 and 7.—Superimposed tracings of profile roentgenographs. Broken line before treatment; solid line after treatment.

and, in contrast to the previous four cases, the maxillary anterior teeth have been carried downward and forward and the mandible has not swung backward. The results in these two cases would seem to be ideal, which is no doubt true for the boy. The girl, however, can retract the mandible sufficiently to produce a complete cusp discrepancy of the Class II type (Fig. 9*B*). The mentalis muscle in this particular instance is not well developed and seems strained. Condyle roentgenographs show this structure to be in the position of the accepted normal when the patient is biting forward but thrust decidedly upward and backward when biting in the posterior position. Nevertheless, there seems to be complete freedom to bite in either position.

The results shown in Fig. 10 are those after only six weeks' treatment of a girl nine years old, although the roentgenographs were taken ten weeks apart.

No measurable change has occurred in the cranium, upper face, or mandible; yet as soon as the interference of the maxillary cuspids was removed by expansion, the mandible assumed a forward position; although it could still be

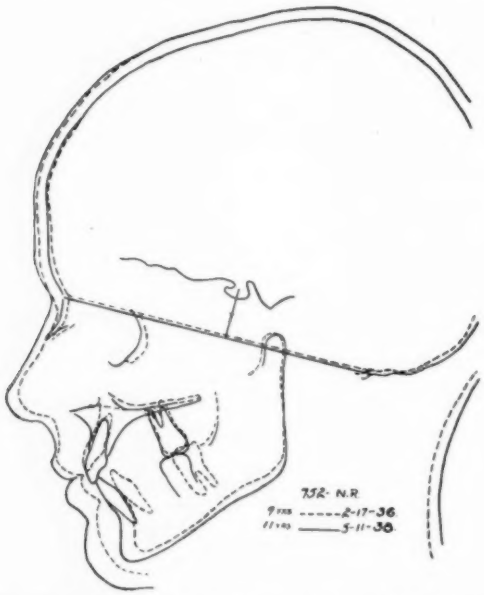
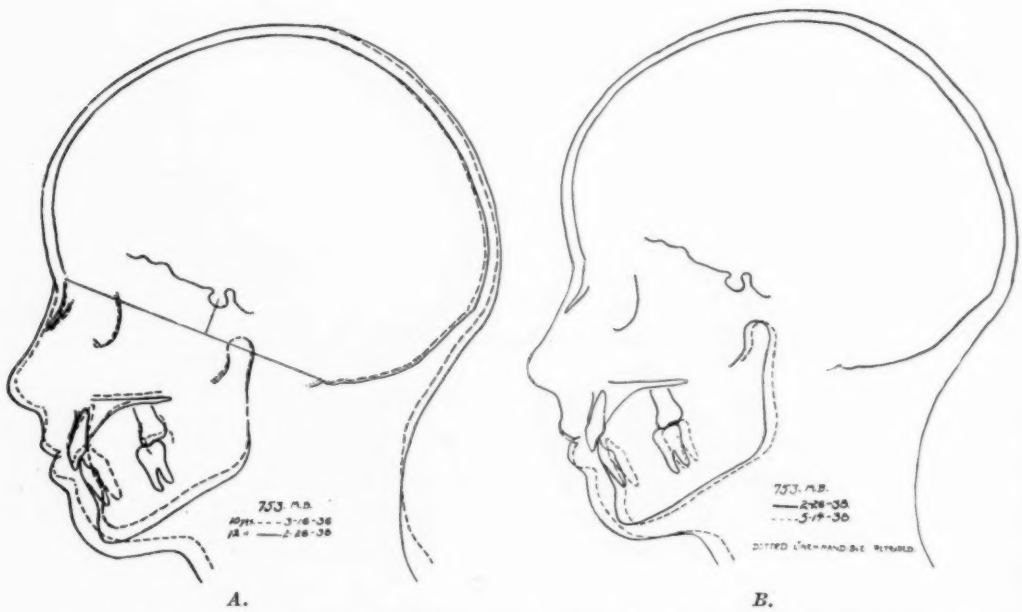


Fig. 8.—In this case the superimposed tracings show an ideal developmental trend. Broken line before treatment; solid line after treatment.



A. *B.*

Fig. 9.—*A*, In this case the superimposed tracings show an ideal developmental trend. Broken line before treatment; solid line after treatment.

***B*, Both of these superimposed tracings are after treatment. Solid line where the patient usually bites is the same as that in *A*. Broken line indicates where the patient bites if the mandible is retruded.**

retruded, the retrusion caused discomfort. Considerable distal movement of the maxillary posterior teeth is evident, but there is only a very slight lingual

Fig. 10.—These superimposed tracings show the results after only six weeks of treatment. Broken line before and solid line after treatment. Note the distal movement of the maxillary molar.

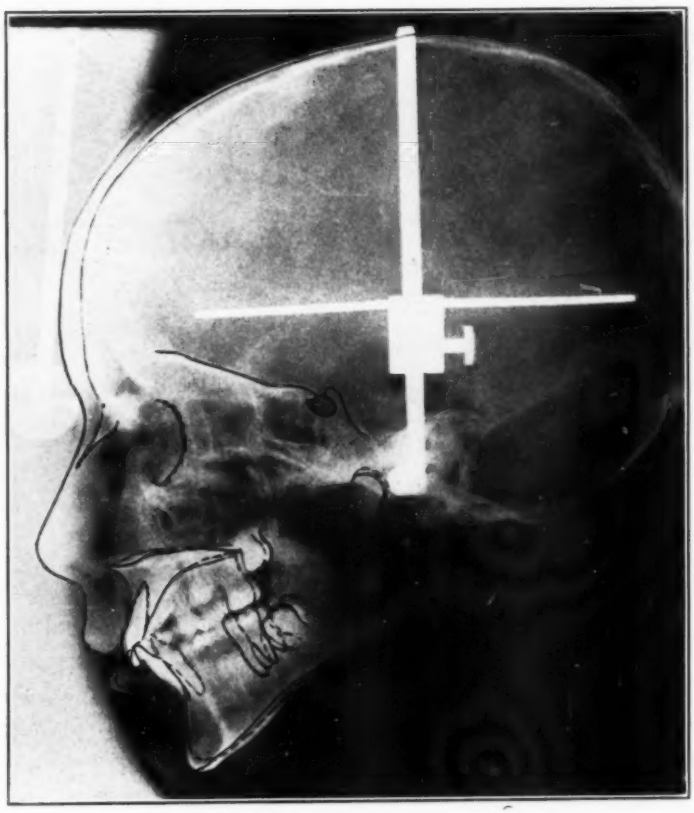


Fig. 11.—Here the superimposed tracings of Fig. 10 are superimposed over the roentgenograph taken after an additional six weeks of treatment. Broken line before and solid line after first six weeks of treatment. Note downward and backward swing of maxillary incisors and mandible during last period of treatment.

tipping of the anterior teeth. The relation of the maxillary and the mandibular posterior teeth is slightly overcorrected. Fig. 11 shows the condition after another six weeks of treatment. The maxillary anterior teeth are seen to be carried considerably downward and backward, and the mandible has also made a corresponding swing in this direction. By this time the patient could not retrude the mandible, because the condyle was approximately in its original position in the glenoid fossa, although the mandible was actually downward and backward. Nevertheless, the tooth relationships were good, and the facial contour gave the impression of being markedly improved, although not so pleasing as it was before the maxillary anterior teeth were carried into the lingual position. Since the bony chin point has not moved distally, there must still be some forward adjustment of the mandible.

Fig. 12.

Fig. 13.

Fig. 12.—Superimposed tracings of a case of dual bite. Broken line shows patient biting forward before treatment; solid line biting back after first five months of treatment.

Fig. 13.—Superimposed tracings. Broken line mandible retruded is the same as the solid line in Fig. 12. Broken line is after an additional two months' treatment. Note the distal movement of maxillary molar and that the mandibles superimposed exactly.

The last case, a boy fourteen years of age, has always had a dual bite. Since there was no tooth interference, the mandible could be positioned to give a correct mesiodistal relation of the posterior teeth or a complete cusp discrepancy of the Class II type. Unfortunately the only roentgenograph taken before treatment was started was that with the mandible in the forward position as shown by the broken line in Fig. 12. The solid outline in the figure was taken five months later when the patient could still bite back into the complete distal malocclusion. There had been no change in the upper face or cranium in this short period nor any mandibular change except an unwarranted amount of intrusion and labial tipping of the mandibular anterior teeth. At that time the maxillary teeth had remained in original positions. Two months later, however, the patient had the correct mesiodistal relation of the maxillary and mandibular

posterior teeth and could apparently no longer bite back into a distal malocclusion. Not until the tracing of the roentgenograph taken at this time (Fig. 13) was superimposed over the one taken two months earlier, when the patient was biting with the mandible retruded, was it suspected that in so short a time all the maxillary teeth, both erupted and unerupted, had been carried distally the width of a cusp, and that the mandible was in the same retruded position as when the patient had bitten back as far as possible. The only mandibular change was a further labial tipping of the mandibular anterior teeth. The facial profile was not so good as when the patient could bite forward voluntarily before any treatment was attempted. With the present relationship of the maxillary and mandibular posterior teeth there is no incentive to bite forward.

SUMMARY OF CHANGES IN THE CASES PRESENTED

In all cases that had been under treatment and retention approximately two years, little, if any, distal movement of the maxillary posterior teeth was found.

The two cases treated only a few months revealed considerable distal movement of maxillary posterior teeth erupted and unerupted.

In all cases the maxillary anterior teeth had been carried downward and backward with the exception of the two showing the best mandibular development (Figs. 8 and 9), in which these same teeth traveled downward and forward, which is more consistent with normal growth and development.

In all cases except those in Figs. 8 and 9 the mandible was carried downward and backward. However, where the bony chin point is not distal to its original position, lengthening of the mandible or forward adjustment must account for this.

The general morphology of the mandible has remained the same in all cases, with no change in the mandibular angle. Of those treated two years the first two cases, Figs. 4 and 5, showed no change in length or height of the mandible; those in Figs. 6 and 7 showed an increase in length but no additional height; while those in Figs. 8 and 9 showed increase in length as well as in height.

With the present amount of evidence no attempt will be made to interpret the results recorded by the cephalometric roentgenograph. The following questions, however, may be stimulating:

1. Is the inclination of the plane of occlusion increased by the downward and backward movement of the maxillary anterior teeth?

2. Does the downward and backward movement of the maxillary anterior teeth undo the benefit derived from a decrease in the curve of Spee so that they now act to inhibit the forward development of the mandible?

3. Is this downward and backward relation of the mandible simply a position imposed upon this structure by carrying the maxillary anterior teeth downward and backward, or is it an abnormal growth trend as is thought by Broadbent? If so, is this abnormal growth trend selective in its action with respect to the mandible alone, since it seems to occur even in the presence of normal growth trends in the upper face?

4. When the maxillary posterior teeth are quickly carried distally, and the maxillary anterior teeth are carried downward and backward, with a resulting downward and backward swing of the mandible, are the lines of force within the dentures then directed in a downward and backward direction which, according to Wolff's law, might tend to retard forward development in the mandible and thus aggravate the condition?

5. Will the maxillary teeth that have been carried distally return to their former position (if originally correct) and through functional occlusion stimulate the mandible to normal development?

6. Does the lowering of the mandible, even though the mandibular angle is actually distal to its original position, change the contour of the soft tissue profile sufficiently to give the impression of an improved facial contour?

These and many other questions might be asked. Although clinical results are now gratifying, they may become more so and be obtained with less effort and less fear of relapse, when the questions are answered.

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NAMING DENTAL AND ORAL ANOMALIES

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DENTAL terminology is, this year, in its perennial state of disorder. Fully aware of this fact, our practical-minded chairman, in planning this meeting, decided to include the solemn subject of nomenclature, on condition that it could be treated in a practical manner consistent with the remainder of this program. He was able to extract from me, in an unguarded moment, a promise to write a paper on the subject; and with the thought that I would receive unlimited assistance from the other members of the nomenclature committee, I proceeded with the assignment. I had not gone far before I discovered that nomenclature committee members are somewhat soured on the world. Nomenclature committees usually include men who have served a sufficient number of years to become justly impressed with the futility of trying to do something about the terminology of their specialty. Fortunately, I learned this early enough so that I could at least begin to understand why it is true.

As I said, the attitude which they assume is justifiable. Now why is it so? In the first place, our committees on nomenclature have always tried to worry along singlehandedly, for the most part. True, some of the broader minds of years past have made an honest endeavor to render our terminology consistent with that of general dentistry, hopeful of avoiding irreconcilable differences between considered definitions of the same term when supplied by authorities from different fields of dentistry; but most efforts of this kind have failed.

It has been repeatedly suggested that our terminology be made consistent with that of medicine and other sciences. At the same time we are confronted with statements such as this one found in a report of the Committee on Nomenclature of the American Dental Association in 1925: "The committee is aware that some of its recommendations seem arbitrary and in conflict with medical nomenclature but we also are aware of the fact that our object and purpose are primarily to make dental terms understandable to dentists."

As long as this view continues to occupy the minds of nomenclature committee members of the various specialties of dentistry, we shall continue to stifle growth and development of the profession along medical and scientific lines. Such an attitude is responsible for the recommendation that the words "bicuspid" and "cuspid" be used when speaking to dentists in order that they may understand; although "premolar" and "canine" must be used in papers prepared for other scientific bodies.

True, these terms might be defended on the basis of custom and long use. Usage is generally the best determinant of values, especially among educated people, unless there be some well-founded or scientific reason for a change. Last

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year, our committee found this to be the case in respect to the term "orthodontia." Usage alone, in this country, might have indicated the continuation of that term, in spite of the fact that it never has been widely used in Europe. It was learned, however, that American usage was the sole defense that could be claimed in support of its survival and that regardless of how well educated an individual might be in general or scientific matters, he had to be directly familiar with the field of orthodontics—or else somewhat of a clairvoyant—to understand the term "orthodontia." It did not suggest its meaning.

Professor Hereward Price, of the Oxford Dictionary Staff and member of the faculty of the University of Michigan, has aptly expressed the situation as follows: "The term 'orthodontia' suggests that it means a flower, a disease, or a city in Asia. 'Orthodontics,' on the other hand, is neat in appearance, easy to pronounce, and tells you at once, more or less, what it means. It is on a line with 'physics' and 'statics' and similar words. The case of 'ics' is still more simple. Since the fifteenth century it has been used in English to denote a science. It is a direct translation from the Greek, and we may say that this sort of ending has been used to denote a science for thousands of years. If you speak of 'orthodontics,' I know at once that you are speaking about a science and do not need to start guessing wildly in which of half-a-dozen categories I must place this word."

One needs only to begin the critical examination of our nomenclature before one wonders how such errors came into existence and gained such wide usage. Perhaps it has been the result of too much freedom in the coinage of terms, without analyzing thoroughly the meaning of the roots of the word involved. When word coinage is contemplated, it would be a very easy matter to consult an etymologist or philologist and check the term before even introducing it. If this had been done with "orthodontia," the word would never have come into existence. It is the same with nomenclature as with any other field of knowledge: there are specialists for the coining of words just as there are specialists concerned with correcting facial deformity; and when we presume to coin words without expert advice, we are overstepping our bounds just as surely as the etymologist would be overstepping his if, without license, he presumed to treat the dental ills of his neighbor's child.

In a nomenclature report by Dr. W. L. Fickes in the 1926 Proceedings of the American Association of Dental Schools, he suggested that a questionnaire be sent with each list of words being examined by dental teachers with reference to their eligibility to remain a part of the accepted language of the profession. Among the questions to be answered were these: Is the word in current use? How often used? Is it a new word? Is it etymologically correct? Should it be recorded in the list of acceptable terms? Should it be placed on probation in a working list? Should its use be discouraged? Should it be deleted? Is it scientifically correct in its relation to dental subjects? Is it misleading in its relation to facts or correct teaching?

I believe another question might well be added; namely, is it correct in its relation to medicine and general science? Usage is important, but the order of the questions in this list indicates that the author regards it as more important than it actually should be.

It seems to me that a similar, though shorter, list of questions might be prepared as a guide for members of the profession who feel the urge to coin new terms. For example: Is the new term etymologically correct? Does it replace a term which is etymologically incorrect? Is it a simpler form? Does it sound pedantic in comparison with the old term which is not glaringly incorrect or inadequate? Is the suggested word a half-caste word of mixed Greek and Latin parentage?

I would agree with the writer of an editorial in the June, 1925, *Dental Cosmos,* who says, "Much may be said in favor of systematic technical terminology in dentistry as in every activity having pretensions to a scientific basis; we will even applaud prophylaxis, apicoectomy, periodontoclasia, and the others, if, by reason of these verbal ponderosities, the results relating to the things they designate will thrive and improve *pari passu* with their impressiveness as related to the professional dignity of the respective specialists on the one hand and their fee-compelling influence on the other. It has been argued that this type of terminology is consistent with medical ideals and its use therefore enhances the professional flavor and atmosphere of dentistry; possibly so, yet can it be denied that there is about it a suggestion of pedantry, a straining after effect, therefore a suspicion of disingenuousness that is not wholly compatible with the spirit of scientific truth? Is it not just this lack of directness and simplicity about much of our professional terminology or its implication of mysticism and insincerity that raises a smile in the thoughtful when some of our professional terms are given a public airing?"

Very few new terms have been suggested by orthodontists within the past year, so I presume that I shall be forgiven by our president if I publicize two which he suggested. I am not trying to polish the apple but I do wish to refer to the terms "eugnathia" and "dysgnathia" as exhibiting all the earmarks of the most meticulous care in their selection. The prefix "eu" is understood by our Greek scholars to mean "well," implying "normal"; and the prefix "dys" as meaning "bad," implying "abnormal." In Dr. McCoy's paper, "The Diagnosis and Treatment of Deficient Mandibular Structures in Children," published in the June, 1937, issue of the *Journal of the American Dental Association,* he makes the following statement: "All anomalies will fall under two general classifications; namely, those designated as eugnathic, in which the teeth only are involved and those termed dysgnathic, in which the maxilla or the mandible or both are included in the deformity. This latter group is the more serious and requires the greatest judgment and skill in both diagnosis and treatment. In this group (dysgnathic anomalies) are to be found those cases where, inclusive with other anomalies, the mandibular structures are underdeveloped and frequently malrelated in their facial relationships." We are indebted to Dr. McCoy not only for the addition of these terms to our nomenclature but for his impeccable adherence to accepted standards governing word coinage.*

*In the discussion following the reading of this paper the statement was made that Dr. B. E. Lischer had previously used these terms. The author does not wish to assign credit for the origin of these words but rather wishes to use them as examples of proper principles of word coinage.

Dr. C. C. Howard must have had in mind the need for such a distinction in terms when he suggested, some time ago, the terms "growth case" and "non-growth case," meaning that some cases were involved in malalignments without apical base involvements and other cases, the reverse. The terms eugnathic and dysgnathic convey their full significance closely bound up in the meaning of their own roots without need for additional explanation and therefore without hazard of misinterpretation. This feature is a defense for any newly coined term, and I bring it up as an example of how, in the future, one should go about the coining of new words—if coin he must—keeping in mind that there is no particular virtue in the act.

In a helpful letter recently received from Dr. Bernard Wolf Weinberger, who is a fellow member of this committee, he makes the following statement: "I am absolutely opposed to the present trend of coining new words and definitions unless it will fit in with co-related sciences." So much for word coinage.

Now let us read what Dr. Weinberger has to say further concerning correlated nomenclature: "The time is long past when dentistry can consider itself something separate. Whether we are part of the medical profession or not is a thing that can be answered in several ways, but if dentistry wants to be accepted as a science, it must realize that it is but a part of a large group and therefore must fit in with others: that dentistry is not something which belongs to the United States, but is a part of the F. D. I., an international institution, and that before we accept our own conclusions these must be submitted to the above organization for their consideration and something adopted that can be used universally. Orthodontia is a part of dentistry in that respect, and dentistry is a part of medicine, anthropology, etc.

"Some years ago, I suggested . . . that the whole matter be approached from a different angle . . . but nothing came of it. It is for that reason I feel that whatever effort is made by the American Association would be of little value. There is altogether too much confusion because more do not understand our own aims. There is no better example than the controversy now existing regarding abbreviations of dental periodicals. There is a tremendous amount of work which should be done; but, unless it can be done along the lines above suggested, I personally believe it would be time wasted. For years the society has asked men to appear before it, such as Gregory and Hrdlicka, and yet is not willing to work with these men in adopting for dentistry a nomenclature which has been accepted by them for hundreds of years and is internationally understood. I trust that I have made the point clear."

Now, from Dr. Weinberger's remarks and those of my own which preceded them, you can well see what the situation is and what hope we have of improving it as long as we remain apart from organized activities of nomenclature committees in all other allied fields. If we will but look beyond our noses, we shall find two very well established systems of nomenclature to link up with, contribute to, and receive benefit from. One of these is the National Conference on Nomenclature of Disease, whose origin may be traced briefly as follows: The first system of nomenclature of diseases was devised 101 years ago by William Farr in London. For 90 years medicine evidently had troubles similar to those our profession is having. The medical nomenclatures in use throughout the United

States varied in form from alphabetical lists of diseases to elaborate classifications. Hospitals, health organizations, and insurance companies were obliged to devise their own nomenclatures or, having borrowed an existing one, promptly proceeded to modify it beyond recognition. This confused multiplicity of effort was due to the absence of any central guiding influence. In each new nomenclature, the terminology employed represented the personal choice of the author and was therefore open to individual criticism and continuous alteration.

For the purpose of remedying the existing confusion, a conference on nomenclature of diseases was held in New York on March 22, 1928. Invitations to this conference included the American College of Surgeons, the American Heart Association, the American Hospital Association, the American Statistical Association, the American Surgical Association, the Association of American Physicians, several of the larger New York hospitals, and the following federal services: Bureau of the Census, United States Public Health Service, the Medical Department of the Army, and the Medical Department of the Navy. At this meeting, the present organization, The National Conference on Nomenclature of Disease, was formed, the primary object of which was to unite the important national societies representing medicine, surgery, and their specialties, the federal medical services and interested national health organizations and life insurance interests in an effort to develop a standard national nomenclature of diseases.

The first publication of this organization, called, "The Standard Classified Nomenclature of Disease," appeared in April, 1932, and revisions and reprintings have occurred regularly since that time with the financial support of the Commonwealth Fund. A group of 14 large and small hospitals installed the new nomenclature in their record rooms in order to subject it to an intensive trial. In 1932, 22 national clinical and other societies voted their approval of the work at their annual meetings.

This nomenclature has been designed primarily for clinicians. Therefore, the clinical point of view has always been permitted to dictate a possible choice of terms or arrangements, provided it was not at variance with scientific accuracy or completeness. This concerted effort on the part of various fields of medicine cannot fail to exercise an influence upon the accuracy and precision of medical thought.

What objection could there be to the inclusion of dentistry and its various specialties among the group collaborating on this piece of work? The only difficulty I see would be one existing within ourselves: an unwillingness on the part of our membership to follow the lead of nomenclature committees who wish to lay aside all petty or political prejudices concerning present terminology. Medicine has not had to throw away all its old terms and neither would we; but cooperation with committees in other fields whose present activities have evolved from decades of slow advance would benefit us much.

The title of this paper confines it to the names of anomalies. There is the anatomical, as distinguished from the pathological side of our nomenclature, however, which must also be recognized. This brings us to a consideration of the

advisability of cooperating with those who occasionally re-edit what is called the "Basel Nomina Anatomica," known as the B. N. A. This compilation of terms was first published in 1901, after six years of work during which the committee reduced 30,000 anatomical terms to a mere 5,000 by omitting the mass of synonyms. The B. N. A. is kept in practically a constant state of revision; and, although there might be difficulties involved in the inclusion of our anatomical terms, we could at least make an attempt; and I suspect that practically every anatomical term which has a right to continue in use would be found already in the B. N. A. Our recommendation is that the Nomenclature Committee of the American Association of Orthodontists be instructed to investigate the possibility of an affiliation with those in charge of the National Conference on the Nomenclature of Disease, and also with the B. N. A., and report progress at the next meeting.

Not all dental terms will be included in the two above categories, since there are chemical, physical, metallurgical, and engineering terms, etc., also to be considered. These, likewise, should be maintained in a state consistent with allied scientific nomenclatures.

Some of you will inquire why no comment has been made concerning such glaring misnomers as distoclusion, posteroclusion, mesioclusion, anteroclusion, and a host of such terms. Others will inquire why their pet terms, anteversion, retroversion, protraction, retraction, etc., have not been endorsed in this report. In reply to these and all other queries, it may be said that such action must be taken only after painstaking and closely coordinated action on the part of the committee, guided by the principle of close interrelationship with medical and other allied scientific nomenclatures. When such a plan is finally endorsed, it will then be the duty of our committee to renovate completely the professional language; cull out all etymologically indefensible terms; publicize its activities in a separately edited portion of the AMERICAN JOURNAL OF ORTHODONTICS; argue with the profession directly and through the JOURNAL for a few years; and as rapidly as possible publish a list of approved terms and a list of obsolete terms recently condemned. Success of the above suggestions, however, is contingent on one thing; namely, whether or not we first affiliate with the National Conference on the Nomenclature of Disease, and with the B. N. A.

Again, in closing, we recommend that the Association instruct its Nomenclature Committee to investigate ways and means of bringing this about.

A PLEA FOR SIMPLICITY IN ORTHODONTIC MECHANISM

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IT IS virtually impossible to find any recent paper on orthodontic treatment or to listen to any discussion of orthodontic problems which does not at least mention *growth* and *development*. And, if any appliance or system of appliances is advocated, to hear claimed for it the advantage of adaptability to the *biological approach* or the ability to cause *physiological tooth movement*. At times one cannot help but wonder if these terms are much more than just *terms*, or if they really convey a great deal to the minds of many. Also that perhaps Hellman[1] is not so far from correct when he states:

"The term biology has come to be used rather widely. But what it stands for, I am afraid, is little understood. In its present implications, it seems to be linked with the use and effect of certain mechanical devices. Just like the inference of some that by means of certain Angle appliances it is possible to carry out 'physiological treatment,' others imagine that by means of the lingual appliance it is possible to practice 'biologic orthodontia.'

"So far, some of us have learned to talk about development, but most of us have not yet overcome the impulse to do things which oft interfere with it."

Granting that every recognized appliance or system of appliances has its advantages, disadvantages, indications, and contraindications, let us devote our thoughts to their consideration as a whole and attempt to evolve a philosophy which may lead to some definite conclusions.

Our approach to the mechanics of orthodontics must be realistic and rooted in ethical concepts. As pointed out by Woodbury,[2] "If, lacking fundamental knowledge, we undertake a treatment on an empirical basis, let us recognize it as such, rather than attempting to justify it on spurious grounds of pseudoscience. To consciously distinguish what we know from what we do not know is often difficult, but it is fundamental. Only in such an atmosphere will research flourish and consistent progress be possible."

Almost everyone seems to agree that simplicity is desirable and claim it as a virtue in the construction or operation of his particular appliance. If complexity is admitted, it is with the statement that when simplicity interferes with efficiency, simplicity must be sacrificed. But is it not too often abandoned needlessly and to the detriment of the patient?

The limitations in the use of complex appliances are further expressed by Woodbury[2] in a paper on "Orthodontic Suppositions" as follows:

"A supposition of a different order and one that tends to limit our usefulness is that proper orthodontic service can be rendered only through the use of complex appliances and the application of a very exacting technique. A recent textbook takes this attitude. The author assesses the suitability of the

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various appliances in present use. The only one he finds acceptable in the light of the criteria he applies is one that was designed to control with precision the movement of every individual tooth and that calls for a most exacting technique in its construction and manipulation. This conclusion on the part of the author has at least two important implications. First, it takes for granted that the operator's knowledge of the physiologic milieu of the teeth is so complete that he can decide with confidence the precise position of each individual tooth with the assurance that the validity of his judgment will be upheld by nature. That is taking a very great deal for granted. Second, it places orthodontics beyond the reach of all but a paltry fraction of those who need it."

In personal correspondence Alfred P. Rogers of Boston expresses the following thought: "The orthodontist of the future in order to meet the demands of the public must bend his energies in two directions or perhaps I had better say three. One step is to create more simplified methods of treatment, thereby making it possible for each one practicing orthodontics to be able to carry on satisfactorily a larger number of patients. This means that the orthodontist must develop simplified methods of appliance construction and application, that he know better how to judge the natural growth processes, and be able more frequently to allow the patients under his care to go without mechanical interference."

I believe in just as much complexity as is necessary, and occasionally this involves the insertion of both a considerable variety and a quantity of appliances; but I do not feel that because one is successful in a complicated case by means of extensive and complicated appliances, he is justified in imposing them on almost every case that passes through his hands. A great percentage of cases with good developmental tendencies respond far better to the stimulation applied through simple mechanisms.

The late Frederick C. Kemple,[3] speaking on "Observations on a Few Problems of Orthodontia," said: "As a matter of fact, teeth can be moved with almost any sort of an appliance; and they can be moved at any age from two to seventy-two. The osseous tissues are noted for their ready response to pressure. The form of appliance to be used is of little importance if it is used with intelligence, skill, judgment, and a knowledge of the possible dangers to the teeth involved. Several years ago I became convinced, to my own satisfaction, through my own experience and my observation of work done by others, that the more complicated the appliance is, the less efficient and more dangerous it becomes. For this reason, I prefer to use the very simplest form that can be satisfactorily employed for the purpose."

I also agree with McCoy when he states: "I am a firm believer in using appliances which supply adequate control so that the needs of our diagnostic findings may be fully met, but to see every tooth in the mouth banded and brought in contact with an arch wire having rigid unyielding attachments, or to see every case wearing both a labial and a lingual arch wire above and below, seems rather terrific to me. Granting that *some cases* need such control, to supply every case with such complicated mechanism, to my way of thinking, appears to prove such orthodontists unthinking slaves to routine. Equally unskilled demonstrations are seen where *inadequate* appliances are employed,

with the operators attempting to treat their cases by 'wishful thinking.' A misinterpretation of the principles given us by Mershon has been responsible for many in this group, and perhaps we may add, 'plain damn laziness' has entered into the picture."

The ideal towards which all the healing arts strive is to recognize when diseases or malconditions may be prevented or when treatment is indicated in order to accomplish the greatest benefit with the least amount of interference. In this way the physician applies his drugs or the surgeon his knife. In the same manner mechanical interference is the prescribed measure of the orthodontist. Is it not fitting then to assume that with the scientific knowledge at our disposal for effecting an accurate diagnosis, the treatment resulting should be made with the same aim in mind?

Eby,[4] speaking on appliances, states: "If, then, our theme is to be so skilled as to do the least we can at the proper time, why should it not be done as simply as would be reasonable to assume? If that is true, then light, clean, compact and thoroughly flexible appliances would seem to be the ones to which nature should best respond."

Prior to 1900, orthodontic appliances were more the designs of individual ingenuity. There were a few systems extant, but for this presentation I shall mention only the works of Edward H. Angle, Calvin S. Case, and Victor Hugo Jackson, who were the principal representatives of definite lines of thought. These men were dyed-in-the-wool exponents of their own respective beliefs, and each one spent his life propounding what he thought was the soundness of his claims. A careful study of their early textbooks and other writings will readily reveal the differences of their conceptions of the orthodontic problem. I would not dare claim or leave the impression that these men had invented systems of appliances around which they built their theories of tooth movement, but I feel it safe to say that the orthodontic problem was at that time being attacked from the mechanical point of view, and all the theories attached to the movement of teeth and the changes which occurred throughout the face were explained without too much sound scientific foundation. In other words, the orthodontic problem was, practically speaking, a mechanical one, and the movement of the teeth was supposedly accomplished by mechanical means expressing force rather than stimulus. The matter was to a large degree taken out of nature's hands and resolved into a mechanical problem without giving nature any part to play, or without recognizing the part she was obliged to play.

Hellman[1] tells us, "The traditional aspect of mechanics, for example, has often been a source of misunderstanding. Because mechanical devices are used to move teeth, it is also assumed that the tooth movement in itself is a mechanical process. Thus the movement of teeth by mechanical means was thought to take place in accordance with physical laws. Newton's law of action and reaction was enough to explain that. On the ground of such explanation, it was thought that, with the aid of a perfect mechanism handled with superior skill, tooth movement is possible without restraint. More recently, however, such an assumption did not satisfy. Actual tests failed to prove it. Experimental evidence demonstrates that, when vital teeth held in place by living tissues are

moved about by mechanical devices, the response is different from that of moving a physical body implanted in an inert medium.''

The exponents of the fixed appliance made their first objective the necessary security of anchorage, while the exponents of the removable appliance made theirs that of the application of springs. In the one instance it became necessary to employ mediums of stress, such as the use of nuts and ligatures which could be manipulated with the appliance in position. The second type required the necessity of removal in order that the principles of the spring could be adjusted. The one represented intermittent force beginning with a maximum of pressure and diminishing to a minimum, with stability of anchorage; the other represented a milder spring force, more uniform and constant in nature, at the almost fatal loss of security of attachment.

Like all things, these various types of appliances were fraught with advantages and disadvantages. It is interesting to note that the sounder principles beneath these designs of appliances are points of merit and that with the elimination of their more objectionable factors definite progress has been made.

Recognizing the value of the spring stimulus, Angle later devised the pin and tube, then the ribbon arch and more lately the edgewise mechanism. In these evolutionary changes, he still recognized the necessity of security of anchorage and, still setting his objective in the arch form desired, devised the plan of banding the teeth and making attachments, to the effect that he could place on the teeth an arch wire which could gradually be straightened out until it had resumed the measured form intended and had brought the teeth out with it.

With removable appliances practically passed from the active field, particularly in the hands of those who specialize in orthodontics, they have left the contribution of the indispensable value of the mild constant stimulus of a spring.

Mechanical genius must be recognized and duly credited with the part which it has accomplished in the progress of orthodontic mechanisms; it remained, however, for other trains of thought to enter the field and make some revolutionary changes in the thinking processes of men. It was necessary to rearrange the principal factors in the general scheme of things orthodontic—to put them into a new trend of sequence and straighten out the lines of thought so that the relative value of every part of the entire science and practice could be put in its logical place. At this stage of progress the work of the scientific thinkers began to be apparent, and the result of their efforts to change the entire aspect of the situation.

So rapidly did this scientific growth occur that thought was diverted from its mechanical concentrations, and gradually there was revealed the human face with all its constituent parts, plus the influence which the rest of the body together with heredity and environment has upon it. This revealed the fact that as the head develops, from inception to full adulthood, it is a problem of growth, and it is the changes which occur within all the structures of the face, of which the teeth are only a part, that we are dependent upon for our results.

A study of an individual mouth gradually became more and more a study of the entire individual, and it was found necessary to do as much as possible to

check the entire biological and physiological background that might influence the existing condition of the teeth and face. More and more the nature of inherited limitations plus acquired influences was revealed.

The biologic background of orthodontic procedure was summed up by Mershon,[5] one of the leading exponents of this school of thought, in the following words:

"Who of us knows enough of the periods of growth and the directions of growth to say where teeth belong? They belong in positions which they will find eventually for themselves, retainers or no retainers. We do not have the last word in orthodontia. Nature has it. Our only excuse for being is that, with care, we can eliminate factors which are interfering with natural development. We cannot work toward a definite end. We can only remove obstacles and then allow natural development to follow through to maturity. If orthodontists grasped this fact, they would not begin treatment whenever a patient arrived and continue treatment without interruption until a premature completion and the insertion of retainers. They would, with infinite care, help nature only during those periods when the most benefit and the least harm would result."

In past years in addition to the changes and improvements made in the appliances already mentioned, many other appliances were introduced which have merit and when properly constructed and judiciously employed are of considerable aid to the orthodontist. These are all known; so it will suffice just to mention a few; namely, the high labial arch of Lourie, the open tube of McCoy, labial hooks of Ketcham, the twin arch of Joseph E. Johnson, the new brackets of Sved, the fixed removable appliance of Pollock, and the many various uses of coil springs as advocated by Arnold.

As one who clearly grasped the picture at a certain time, John V. Mershon produced an appliance technique with pattern and design intended to meet all these changes which occur inherently and to work with them as fundamental factors over which his appliances would exercise a certain control. His theme as it has been universally accepted was to attempt to direct, restrain, or release the growth tendencies so that the positions of the teeth and structures of the face would reach their maximum improvement in consonance with growth, rather than forcibly to go beyond these limits. In this way orthodontic procedure has become from the standpoint of treatment and mechanism a more accurately prescribed therapeutic measure and less and less an empirical process. Rather than to take any one particular appliance and empirically adapt it to cure all the deformities of the jaw and face, Mershon and his followers have believed more in propounding a mechanical formula containing definite principles but specifically applied to meet the conditions of the individual case. One of the great principles behind the entire thought is sufficient flexibility so that none of the agencies which stimulate growth will be interfered with, but only constructively assisted by such mechanisms as may be present.

In order further to substantiate my plea for simplicity I should like to quote from two or three men who have made statements which have a direct bearing on this subject.

From Rogers'[6] paper on "Simplifying Orthodontic Treatment" I quote: "It has been demonstrated that during the progress of treatment under me-

chanical stimulation, the use of the muscular function may enhance the treatment in that fewer appliances are needed, and that the retention of the corrected malocclusion is far more easily secured. It has been demonstrated too, that frequently one arch may be developed in a secondary manner by the use of an appliance on the opposing arch only, the secondary development being due to cusp relation and increased muscular function."

In his paper on "Rational Treatment," Porter[7] states: "There are many methods being used which are rational in the minds of their advocates. Each method has its advantages and its disadvantages. A method advantageous in one case may be foolhardy in another. While a constant user of one appliance may become most skilled in that appliance, it is questionable whether his skill would warrant his using that type of appliance in all cases, realizing the desirability of simplicity, efficiency, cleanliness, and gentleness of stimulation."

In a personal communication on the subject of treatment, C. R. Baker writes: "In my own work I try to decide just what should be done as the first step in treatment and then make the simplest appliance to do that particular work. After getting that done, I disregard the first appliance and try to make another simple appliance for the next step in the treatment. If part of the former appliance fits in with this plan, fine; but if not, it is put into the scrap pile and an entirely new appliance is made. I continue this plan throughout the treatment."

Many cases are on record and every orthodontist is familiar with others where successful orthodontic treatment has been largely responsible for the prevention or cure of severe mental disorders; nevertheless as indicated in a paper by James H. Wall,[8] assistant medical director of New York Hospital, Westchester Division, there are cases, and perhaps the number is much larger than some think, for which a more complicated and conspicuous appliance, although it might seem to be mechanically more efficient, is decidedly contraindicated. He states: "In dental and medical work we must be careful in choosing the time for instituting certain types of corrective treatment. A case presentation may illustrate the point. A girl of seventeen was admitted to this hospital for the treatment of a depression. She was the younger of two girls. She was less attractive than her sister, and her feelings of inferiority had been accentuated by her parents' unwise remarks in comparing her with her sister. Her parents forced her into social situations which were beyond her. One year prior to her admission to the hospital she was sent away to boarding school in an attempt to cure her of shyness and awkwardness. At the same time the parents thought her teeth should be straightened, and she went away to school with very complicated orthodontic appliances in her mouth. The appliances were uncomfortable, and at a time when she was endeavoring to increase her poise, she had to answer a great many questions about her mouth. Naturally her sensitiveness increased and soon she became depressed and suspicious. It became necessary for her to leave school and come to a mental hospital. There was a remarkable improvement after the appliances were removed. After six months in the hospital she recovered. The orthodontic work did not precipitate her mental illness, but it acted as an extra burden, accentuated her feelings of being different, and lowered her resistance."

It seems logical to state that in every branch of medicine all forms of therapeutic measures, regardless of the type, are approached through the avenue of simplicity with an increase in complexity to that degree *only* which is necessary to meet the requirements of the individual case. The theme of this paper has been the attempt to apply this fundamental law to the principles of practice and treatment in orthodontics. Quotations from many able thinkers seem to confirm these convictions beyond the question of doubt. This paper might perhaps have been more aptly entitled, a plea for simplicity in orthodontic *treatment* rather than mechanism, and suggests the following conclusions:

1. Orthodontics is a problem of growth and development, and the orthodontist should be prepared to recognize and appraise the natural growth processes in order to create more simplified methods of treatment.

2. Many of us have learned to talk in terms of biology but practice in terms of mechanics.

3. *All* recognized orthodontic mechanisms in use today possess certain advantages and disadvantages.

4. Appliances which are most effective in the first stages of treatment may not be the most efficient in the final stages of alignment.

5. Simple appliances designed to accomplish steps in treatment and changed as the case progresses often possess advantages over original appliances designed to accomplish the entire correction.

6. Expert skill in the construction and manipulation of any one type of appliance is not in itself a guarantee that the appliance is suitable for all conditions.

7. Appliances are dangerous when sufficiently complicated to invite hygienic disorders including decalcifications, caries, and injuries to the gingival and investing tissues.

8. There is no one appliance which is best for all cases. Successful results in complicated cases with extensive and complicated appliances do not justify their use in all cases.

9. The movement of teeth as accomplished by the aid of our appliances is considerably different from that of moving a physical body implanted in an inert medium. "No appliance used today, nor the much more heavy and powerful ones formerly used, can cause movement of a tooth in the mouth of a cadaver, for after death there is no circulation and no cell metabolism." (Kelsey.[9])

While it may be possible to predetermine with some degree of accuracy the relative tooth positions and desired arch form, it very often is not possible to predict every step which may be necessary in mechanical therapy to bring this about. Even in numerous apparently complicated malocclusions, when one or two interferences have been removed, many or all of the remaining factors of the deformity are taken care of in the normal developmental process. We must always keep in mind that there is an inherent tendency in nature to develop towards the normal. And nature, when intelligently aided, is the best orthodontist.

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MEDICAL CENTRE

RACE, GROWTH, AND OCCLUSION

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IT IS with considerable hesitancy and a rather marked feeling of insecurity that I embark on a discussion of so large a subject as race, growth, and occlusion. Particularly so when I realize that a synopsis written prior to the formulation of material for this essay suggested a great deal more by way of content than I am able to provide.

It is significant to note, at this point, that in the general field of human biology, whether it be medicine, dentistry, or some other discipline, the trend of thought is toward the understanding of biologic process and interrelationship rather than toward isolating simple reactions of cause and effect. And, although this attitude greatly complicates the work of the student of human biology, it is productive of more critically evaluated results, in other words, more painful perhaps, but certainly more desirable.

Dr. Hellman is one who has repeatedly, and often none too gently, emphasized the need for a fuller understanding of the biology of occlusion as contrasted to the widespread application of orthodontic stresses and strains to morphologic categories. I quote from an article written by Dr. Hellman in 1933, "One of the most incomprehensible attitudes in orthodontia is the indifference toward the need of understanding more thoroughly the relationship of mechanical skill to the fundamental problems of malocclusion of the teeth." In 1936 Dr. Hellman listed the three needs of orthodontics in the following order: (1) an understanding of the process of development, (2) an understanding of fundamental biologic processes, and (3) mechanical skill. These two citations illustrate an attitude that is becoming prevalent in the orthodontic profession.

Professor Hooton of Harvard University has been particularly interested in the development of researches that will give a fuller understanding of human biology. In an address given before a group of physicians and later published in Science magazine he outlined a number of researches which he believed to be basic to an understanding of the problems of medicine and dentistry. Here he took the medical and dental professions rather seriously to task by stating that physicians and dentists in general work backward from the grave and, on the whole, are little concerned with the phenomena of life until they have become definitely abnormal.

With this brief introduction let me proceed directly into some items that have come to my attention which may have significance in contributing to a further understanding of the problems relating to occlusion.

The potential influence of race and race mixture in occlusion came to my attention rather incidentally. During the process of collecting data for the

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anthropology of native and American born Armenians* I was persuaded by Dr. George R. Moore of the Orthodontic Department of the University of Michigan Dental School to include a few observations on the dentition and associated structures. Consequently a record was taken which included the following items: number of permanent teeth erupted, number of caries and fillings, number of extractions, amount of tooth wear, degree of crowding or spacing of the anterior teeth, and type of occlusion. In recording occlusion Angle's classification was followed.

Due to the fact that I was—and still am—inadequately trained to make other than the more gross observations, I was very careful to record all occlusions as normal unless the malrelations were of an unquestionable magnitude. There is little doubt that by following this procedure I probably omitted a sizable percentage of malocclusions, as I have noticed that my grading as compared to that of an orthodontist gives a considerably higher percentage of normal occlusions.

Detailed statistical analysis of the above material in conjunction with the anthropologic data revealed a number of facts which I believe to be of value to the profession of orthodontics. I shall omit a discussion of the statistical methodology used in the analysis of this material and present to you the findings.

1. There is no evidence that Armenian children have a different eruption rate of the permanent teeth than north European and American children.

2. The incidence of dental caries is 31 per cent higher in American born Armenians than it is in Armenian born Armenians. This is in spite of the fact that the latter averaged 19 years older than the former. This indicates that dental caries can be ascribed to nonracial and nonhereditary factors in this case.

3. The amount of tooth wear is considerably heavier in the Armenian born than it is in the American born Armenians. This is partly due to the greater age of the former and partly to a generally more severe diet of the Armenian born.

4. There are no essential differences in the percentages of occlusal anomalies between the native and the American born Armenians that can be ascribed to environmental conditions.

5. Malocclusions are definitely limited (8.03 per cent) in relatively homogeneous Armenoid populations.† The dental arches are absolutely large with ovoid shapes predominating. Crowding in any region is practically absent and spacings are not marked. Individual anomalies are found largely in conjunction with mutilation as a result of extraction. (Evidence of dental care other than extraction is generally lacking.)

6. Malocclusions rise to high percentages when Nordic or Mediterranean racial elements are added to the Armenoid type. These malocclusions, I believe, are to be ascribed to hereditary factors and not to other causes.

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*Doctoral Dissertation, Harvard University, Cambridge, Mass., 1938 (unpublished).

†The term Armenoid is used here in the descriptive sense only. From the racial point of view the Armenoid type is a hybrid with two racial sources, the Iranian plateau and the Alpine stocks.

In order to clarify points 5 and 6, I shall give a brief outline of the procedure followed. I was interested in noting what effect blond admixture in Armenians had in the anthropometric measurements and indices. All persons showing blue, green, or gray in their eyes were sorted out and compared with the remainder who were entirely brown eyed. Detailed analyses of these sorts revealed that we can assign the blond traits to the Nordic race; other sortings were used to remove Mediterranean racial elements. It is significant to note that every bodily measurement and index was changed, the majority of them to a statistically valid degree. Of more importance to the orthodontist is that fact that malocclusions were in excess of 50 per cent in the Nordic-Armenoid and Mediterranean-Armenoid groups and only 8 per cent in the Armenoid group. In addition the above groups showed an excess of 27 per cent in cranial and facial asymmetries over the Armenoids. These percentage differences are of an unquestionable magnitude. Table I gives a general idea of the head and face measurements of the two parent groups and of the mixed group.

TABLE I

	NORDIC	NORDIC-ARMENOID	ARMENOID
Head length	199.47	187.20	182.90
Head breadth	152.11	157.64	158.86
Frontal minimum	106.02	108.36	107.68
Bizygomatic diameter	138.80	142.93	144.45
Bigonial diameter	107.22	109.01	110.07
Face height	123.05	129.00	128.10
Upper face height	67.80	79.75	76.60

Head length and bizygomatic diameter are intermediate to the two parent stocks. Head breadth, and bigonial diameter more closely approximate the measurements of the Armenoid. Frontal minimum diameter, face height and upper face height show heterosis and are in excess of both parent stocks. As indicated by the table, the most marked change is in the upper facial length. The malocclusions, for the most part, are Class II, Division 1 Angle. In this case it seems that the malocclusions have arisen largely as a result of maxillary overgrowth as a result of heterosis.

The same type of differences obtained in the mixtures involving Armenoid with Mediterranean. Here the mandible did not change as much, and the disproportions are, in general, much more marked. A number of studies on race mixture have indicated that disproportionate facial changes are common, particularly in the facial lengths. Nansen (Armenia and the Near East, p. 237), for example, states, "The chin is generally weak with the profile receding in a line from the upper lip downward." He is undoubtedly referring to a type that is mixed Nordic-Armenoid as my data from the same regions show. Von Luschan (Peoples of Western Asia) describes another type of "weak-chinned" Armenians. Here I believe the type is largely a mixture of Mediterranean and Armenoid. Other data, collected by Dr. Moore and myself, and as yet only superficially analyzed, indicate that hybrids of parents that show widely divergent head and face types, have markedly higher percentages of malocclusions than do those whose parents are similar in head and face form.

At any rate the general nature of what evidence I can gather is that in the crossing of divergent races many irregularities and disproportions are likely to be produced of which malocclusions are part.

GROWTH

Up to this point I have emphasized the hereditary nature of a few facial and dental factors associated with the hybridization of different racial groups. I have also indicated the necessity for further study in individual inheritance. For a few minutes I should like to deal with another aspect of biologic process, namely, growth, or development from birth to maturity. It hardly seems necessary to point to the vast importance of growth as a phenomenon that immediately concerns every orthodontist. A considerable portion of orthodontic work is done upon the organism when it is in a period of rapid change.

Many workers have shown that different parts of the body grow at different rates and that accelerations and retardations of various parts occur at different times. Consequently disharmonies and asymmetries are frequently coincident with a fully normal biologic process. The dentofacial complex is one of the regions particularly susceptible to variable growth rates of its several parts. In addition it is highly functional and rather easily changed by external modifying forces. Evidently then an understanding of the nature of change due to growth and its modifying factors should be vitally important to the profession.

A great deal of work has been done on growth, and the literature on the subject is extensive. But extensive as the published material is, it is still very difficult to find satisfactory accounts of the nature of the developmental process. Many studies involving large samples have been made, and norms have been computed to show the average growth trends in a large number of circumstances. Other statistical constants, such as the standard deviation and the coefficient of variability, have been computed to show the general nature of the population under consideration. Regression constants have been utilized to show intensiveness of associational items. In short, the science of biometrics has brought to bear a great many techniques to enable us to appreciate more fully the meaning contained in mass data. All this information is very helpful and has greatly increased the scope of knowledge in most branches of biology. Useful as biometrics may be as a tool, it cannot compensate for omissions in the material with which it works. The shortcomings of mass averages, measures of dispersion and associations are glaringly evident in the field of growth; the data are accumulating which indicate that mass statistics tend to obscure rather than to clarify the problems of growth. The reason is rather obvious; cross-section constants, such as the mean, the standard deviation, and the coefficient of variability, condense individual variates to points. The connecting of these points at different age levels gives norms which are supposed to represent the process of growth. Lest my discussion become too obscure let me illustrate my point: suppose that we found the stature of a child ten years of age to be 55″ and we wanted to know what this meant in terms of growth. We could refer to height tables and note whether the child was on the norm, or above, or below. We could compare him with the average population and

say he was short, medium, or tall as compared to other children ten years of age. What we could not say is what this means in terms of growth. We do not know the rate of growth, the present status as part of a growth phenomenon, or the future probabilities as an adult.

I shall not take any more time to discuss this proposition further. The point I am trying to bring out is that in order to understand continuity one must have records of continuity.

Many factors affect growth. Heredity is probably the most important. Data are accumulating to show that the maximum achievement of an organism is dictated by hereditary equipment and to indicate that even under stress there is a definite attempt on the part of the organism to achieve this maximum. This may account, in part, for the failure of certain malocclusions to respond to treatment, or if they have responded temporarily to revert to their original condition. At least one prominent anthropologist has gone so far as to say that *all malocclusions are hereditary;* there are many others who are inclined to agree with him. I cannot support his contention. An examination of 500 underprivileged and for the most part undernourished children this last summer showed not only a marked retardation in average growth, both mental and physical, but also a much higher incidence of malocclusion and dental caries than did a well-nourished group from approximately the same racial stock. I am of the opinion that many of the malrelations were due to habits, such as thumb-sucking, which had been continued over a long period of time. I would also suggest that many of the malocclusions observed were ascribable to interrelationships between poor nutrition, retarded growth, and habit, rather than to inheritance. At any rate treatment in many of the cases would have involved dietetics and psychology as well as orthodontics.

The evaluation of status of growth is essential. Here it is necessary to use a number of techniques. The measuring of growth with a chronological yardstick is conducive to many gross inaccuracies. Growth rates of individuals vary considerably; some accomplish maturity more rapidly than others. Hereditary backgrounds and external modifying forces are different and mature individual A is different than mature individual B. For workers dealing with growth it is much more important to know how the individual has developed and how far he is going to develop than it is to know how much time has elapsed since parturition, or where he stands with reference to an average. Let me give some examples of this: one can predict the score on a mental examination more accurately by knowing the number of erupted permanent teeth than he can by knowing the date of birth of a child. The reason is clear; the former measures status of maturity and the latter elapsed time. Another interesting demonstration of this same point—on a group of reading tests administered to children of approximately the same chronological age those having the low scores were also the ones who had fewer permanent teeth erupted, lower statures, smaller weights, and retarded carpal ossification.

Orthodontic procedure then should utilize a number of techniques to ascertain rate of grow" and status of development rather than to depend upon chronological age.

In concluding let me briefly summarize the points that I have brought up in this brief and general discussion of race growth and occlusion.

1. Relatively homogeneous racial stocks tend to have a low incidence of malocclusion.

2. The crossing of races with widely divergent face and head types tends to result in disharmonies and asymmetries and a higher incidence of occlusal anomalies.

3. If the proposition is true for races, it should hold for individuals, since racial heredity is but a statistical generalization of individual heredity.

4. Hereditary factors place the limits that the organism will achieve, and even under adverse conditions there is a definite attempt on the part of the organism to achieve this hereditary maximum.

5. Extra germ plasmic factors as nutrition, injury, and habits can and very frequently do prevent the organism from achieving that status it would were it not for these external forces.

6. Severe or long-lasting forces can produce permanent defects. These defects will not be transmitted but will seriously affect the individual.

7. Growth is a biologic process and during the process of maturation there are many disharmonies due to unequal growth rates of different parts.

8. Growth as a process must be studied from continuous records. Cross-sectional sampling methods tend to obscure rather than to clarify the nature of growth phenomena.

9. Growth should be measured as a percentage-maturity accomplishment rather than as a regular chronological phenomenon.

10. A more complete and a more accurate understanding of human heredity, individual and racial, and of growth is basic to orthodontics or to any other profession dealing with children.

Finally let me say that the conclusions presented in this paper are tentative. The data upon which they are based are very limited in many places. I present them at this time as problems for consideration and discussion; not as authoritative laws.

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Edited by

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DIAGNOSIS OF PARODONTAL DISEASES

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PARODONTAL diseases may be classified in six main types: (1) senile atrophy, (2) atrophy from disuse, (3) gingivitis, (4) marginal parodontitis, (5) parodontosis, and (6) syndrome of marginal parodontitis and parodontosis.

SENILE ATROPHY

Senile atrophy may be regarded as a normal physiologic process. The atrophic changes produce a recession of the gingiva and a resorption of the alveolar crest. The atrophy affects the entire alveolar bone uniformly, and the bone is resorbed to the same level around all teeth throughout the circumference. In the uncomplicated form the gingivae appear healthy, with no gingival inflammation and no pathologic pocket formation. The teeth are firm, but the cementum of the roots is exposed. Uncomplicated cases of senile atrophy, however, are rare, since the recession throughout the mouth allows for the retention of food and debris in between the teeth with a resulting inflammation of the gingiva. Quite common in these cases is a slight chronic irritation of the gingiva causing it to become hypertrophied, a condition which is called hypertrophic gingivitis.

Senile atrophy, however, may also occur in young individuals (presenile atrophy) whose other functions are still at their height. These individuals seem in normal health and show no other senile changes. Very little is known of the origin of this disease. The pure form has no inflammatory changes, and no pocket formation. Loosening of the teeth occurs in the very late stages. As in senile atrophy, cases become complicated by inflammatory changes due to retention of food and debris. This type must be distinguished from parodontosis.

ATROPHY FROM DISUSE

Atrophy from disuse may be thought of in two ways. There is atrophy from disuse, first, due to teeth losing their antagonists and, second, due to a lack of function of the jaws and indirectly the teeth.

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In the dental apparatus Sharpey's fibers, the embedded portion of the principal fibers of the periodontal membrane, attach themselves to the cementum and to the bone. The act of mastication therefore results in a continuous stimulation of the alveolar bone, which consists of a slight pulling stress. By this means the bone remains in function and in health. When this stress ceases as in atrophy of disuse, changes occur which result in atrophy of the bone since the teeth do not need the bone support, as when the function is normal. Therefore this atrophy can be considered a quantitative atrophy since the amount of bone is decreased.

In cases where the teeth have lost their antagonists, there is an atrophy of the bony support and the teeth elongate beyond the occlusal line. This elonga-

Fig. 1.—Presenile atrophy in a man aged 37 years. This is an uncomplicated case in which there is a marked recession of the gingivae. The anterior teeth are slightly loose as are the maxillary left posterior teeth. There are no pockets present.

Fig. 2.—X-ray pictures of case in Fig. 1, showing horizontal resorption of the alveolar bone. The bifurcations of the molars are involved.

tion combined with the atrophy of the supporting bone shows up in x-ray examination as a quantitative and qualitative loss of bone.

In considering a general atrophic condition due to a lack of function of the jaws McMillan states: "The physical development of the alveolar process necessary for increased local resistance is produced only by adequate stresses of mastication received on the occlusal surface. Lack of occlusal stresses, whether produced by failure to masticate resistive foods or by grinding a tooth so that it does not meet its antagonists of the other jaw in any of the movements of mastication results in disuse and lowered local resistance." This lack of function cannot be recognized as a type of disease, but only as a contributing cause for the production of disease.

GINGIVITIS

As its name implies, gingivitis is an inflammation of the gingivae. Since there are many factors that may induce the inflammatory reactions, we may get a variety of clinical expressions, depending in a large measure upon the etiologic factor. Therefore we may classify gingivitis according to etiology, and distinguish a number of separate entities.

It is not always possible, however, to determine on examination whether an existing gingivitis is of local or systemic origin. Therefore it is necessary that one always be on guard because what may appear on the surface as a local con-

Fig. 3.—Marginal gingivitis due to malhygiene. The marked deposits on the anterior teeth can be noted. The gingivae were bluish red and swollen, and the patient complained of bleeding upon brushing.

Fig. 4.—Hypertrophic gingivitis. The gingivae are swollen and hyperemic; the papillae are bluish red. This case is due to malhygiene.

dition may turn out to be an early symptom of some general disturbance, such as an unrecognized blood dyscrasia.

1. *Marginal gingivitis* is the commonest of all gingival inflammations. In its uncomplicated form it is purely local in origin, being caused by some adjacent irritant. The most frequent causes are oral sepsis, faulty restorations, and food impactions. The gingivae are usually red, swollen, and tend to bleed when pressure is applied. The condition may be found throughout the mouth, or it may be confined to single areas. It is very important to diagnose this type early since if left untreated marginal parodontitis will result, especially if the patient neglects to pay attention to the hygiene of the mouth.

2. *Hypertrophic gingivitis* is a gingival disorder characterized by marked hypertrophy of the gingivae. The marginal gingivae appear swollen and may or may not bleed easily when injured. In this type the gingival papillae are

affected more than the rest. The entire gingiva of both jaws or only the incisor teeth may be involved. The gingivae are generally inflamed and bluish red in color, and have a great tendency to bleed. If not inflamed they appear pale and firm.

The causes of hypertrophic gingivitis may be local or systemic in nature. Most common among local causes are oral sepsis, malocclusion, mouth-breathing, and food impaction. The systemic factors are pregnancy, scurvy, and leucemia.

Pregnancy in some women causes general hypertrophy of the gingivae and is called "pregnancy gingivitis" or "gingivitis gravidarum." It occurs toward the middle of pregnancy and lasts usually until a month or two after delivery. The gingivae generally are bluish red and inflamed. Bleeding results from injury, and in some cases starts spontaneously. Small pregnancy tumors may form which are localized excess in tissue production, an inflammatory hyperplasia of so vascular a nature that they resemble hemangiomas.

Systemic diseases, such as scurvy, diabetes, purpura hemorrhagica, and leucemia, may also bring about hypertrophic changes in the gingiva. These diseases do not have specific gingival symptoms and orally cannot be easily differentiated.

3. *Ulcerative gingivitis or Vincent's infection* represents a type of gingival disease distinctly different in its etiology and pathology from other types. While infection plays a part in all gingival disease, Vincent's infection is the only one that is caused by specific organisms. These organisms are called Vincent's organisms, and are a spirochete and a fusiform bacillus. They are present in most mouths in greater or lesser degree, their number depending upon local hygiene. Positive smears therefore are not of great diagnostic value. Ulceration and sloughing of the gingivae are typical symptoms. The disease occurs in two forms, the acute and the subacute. In the acute form there is sloughing of the gingivae, pain, and general malaise. In the subacute type there is no sloughing, and the symptom of pain is vague. Differential diagnosis of the acute type is easily made because of the gingival slough and symptoms of general prostration. In the subacute type, a differential diagnosis is not as easy because of its close resemblance to marginal gingivitis, and because of the variety of pictures that may be presented. It is evidently an attenuated phase of the more easily diagnosed acute type, but the symptoms are held in check by high resistance of the patient.

A diagnosis is best made from the symptom of pain and tenderness of the affected gingivae, and if in a suspected case there are no subjective symptoms, Vincent's infection can be ruled out even in cases of positive smears.

MARGINAL PARODONTITIS

Marginal parodontitis is the local type of parodontal disease in which the symptoms are in keeping with the description of pyorrhea. It may attack several adjoining teeth only, but usually all the teeth are affected. The etiology of this disease is primarily filth, and it is because of its etiology that Gottlieb called it "Schmutz pyorrhea" or "filth pyorrhea." One of the earliest manifestations is a thickening of the gingival margin, which ceases to adhere to the

neck of the tooth. The gingivae are inflamed and bleed easily. Upon pressure pus can be seen to exude from the crevice. A foul odor from the mouth is a characteristic symptom. Pockets are shallow, and their location is not restricted to any definite region of the tooth. It may encircle the tooth completely or may be seen on the mesial and distal surfaces only. Large quantities of supragingival calculus are observed which are deposited on the crown of the affected teeth. Calculus also can be seen in the pockets where it assumes a harder crystalline appearance, because it is more highly calcified.

The teeth in marginal parodontitis do not migrate, and even though resorption of the bone is one of the early symptoms, loosening of the teeth occurs only

Fig. 5.—Marginal parodontitis of a diabetic patient in which there is marked supragingival calculus. This case is due to malhygiene; the patient never brushed his teeth. The gingiva are bluish red, swollen, and hyperemic. Pus could be pressed out of the pockets around the teeth.

Fig. 6.—Marginal parodontitis in a man who never brushed his teeth. There is marked supragingival calculus present and an inflammation of the gingivae. Upon pressure pus exuded from the pockets.

in advanced stages. Alveolar resorption proceeds from the alveolar margin of the jaws and progresses slowly and gradually in a horizontal direction without the production of vertical bone destruction or enlargement of the periodontal space. These conditions are diagnosed by x-ray examination, which shows a more or less definite line of horizontal reduction of the alveolar process with the remaining alveolar bone still unaffected. There is no vertical bone resorption along the alveolar socket, except in very advanced cases due to occlusal conditions or complicated by parodontosis.

Marginal parodontitis may occur in a local form, as stated above, due to loss of contact between two teeth, with food impaction against the gingiva

causing an inflammation and resulting in resorption of the bone. Overhanging fillings and ill-fitting crowns which irritate the gingiva are also causes of marginal parodontitis.

PARODONTOSIS

Parodontosis affecting all the structures around the teeth is a disease of middle life, the greatest incidence being between the ages of 30 and 50 years.

Fig. 7.—Parodontosis. This is an uncomplicated case in a woman aged 36 years. The gingiva was not affected, nor were any pockets present. The teeth, however, were very loose and the patient complained that she could not masticate well as she felt the teeth move.

Fig. 8.—X-ray pictures of case in Fig. 7, showing marked resorption of the alveolar bone.

It affects all the teeth in both jaws, generally, but some single teeth or groups of teeth may be affected more than the others. This is due to occlusal factors.

Migration of the maxillary incisors is an early characteristic symptom and is accompanied by the loosening of the teeth. This migration is a slow process, and is restricted to single rooted teeth; however in multirooted teeth mesial or distal movement has been noticed, but this is not common since multirooted teeth offer greater resistance to occlusal forces than single rooted ones. In the anterior teeth migration is aggravated by the continued impact of the mandibular anterior teeth against the maxillary teeth. This drives the teeth labially and laterally. The teeth may elongate also, protruding from the dental arch.

In the mandible, the teeth migrate in a lateral direction if they do so at all. Thus is the occlusion disturbed and altered in parodontosis.

In the early stages of parodontosis there is no inflammation of the gingiva or flow of pus. No pocket formation can be detected. It is only in the later

Fig. 9.—Parodontosis in a woman aged 35 years who has noticed that her anterior teeth have been drifting. The maxillary left lateral incisor has moved distally and seems to be rotating. There is marked pocket formation on the lingual surface of the anterior teeth. The pockets around the posterior teeth are of the vertical type, but are not as deep as those around the anterior teeth. The gingivae seem normal and are not inflamed. One would not suspect pathology unless a careful examination were made.

Fig. 10.—X-ray pictures of case in Fig. 9, showing marked bone loss, especially in the region of the maxillary and mandibular anterior teeth.

Fig. 11.—X-ray of case shown in Figs. 9 and 10, with gutta-percha points inserted into the pockets before taking the picture. In this way the exact depth of the pockets can be ascertained.

stages that vertical pocket formation results. The location of the pocket is usually restricted to one side of the tooth, and mesial or distal surfaces are the locations which are more generally involved. In parodontosis the pocket is shaped like a cone and is filled with granulation tissue which may become infected and suppurate. When pocket formation is present, usually a marginal

Fig. 12.—Parodontosis. This is a case of a young woman aged 30 years who complained that her teeth were so loose that she was unable to eat without feeling that the teeth were "falling out." Upon examination extreme looseness of the teeth was found. The gingivae appeared free of inflammation, but there were very deep vertical pockets present around the teeth. The patient noticed the maxillary left lateral incisor moving distally.

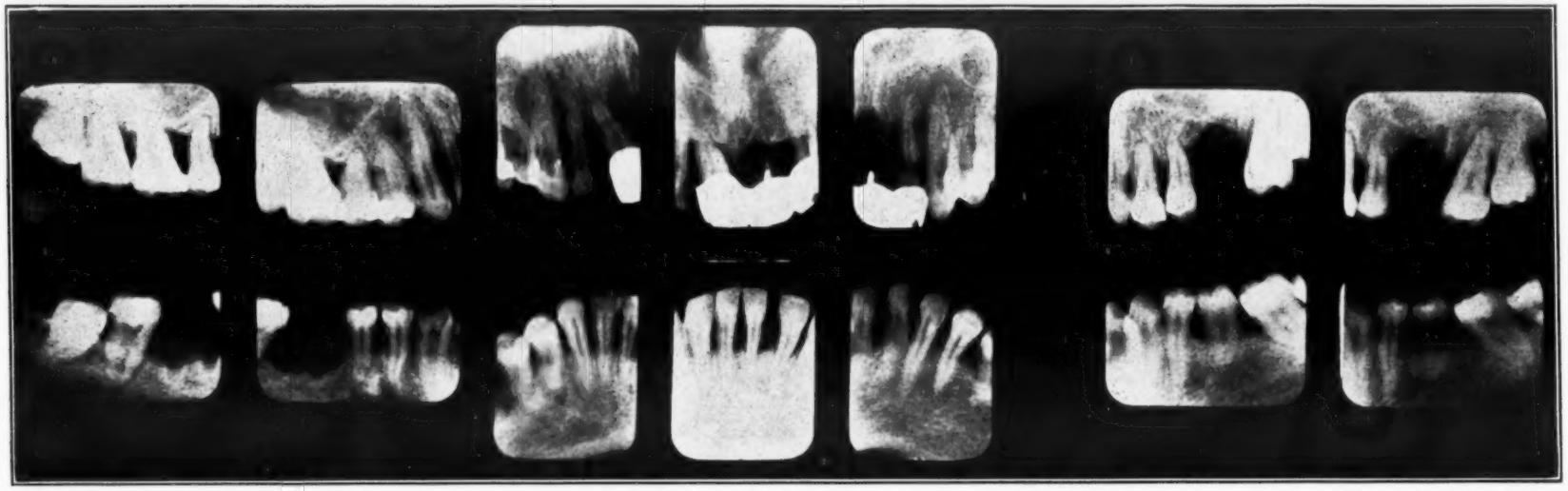

Fig. 13.—X-ray pictures of case in Fig. 12, showing marked bone loss throughout the whole mouth.

gingivitis manifests itself, since pockets tend to allow the stagnation of food debris, which invites infection.

In parodontosis percussion of an afflicted tooth has a different quality than that of a healthy one. The difference is due to the presence of granulation tissue which has replaced the alveolar bone. The sound is dull as compared by tapping a normal tooth.

Calcareous deposits are of the subgingival type and are found encircling the neck of the tooth. The very bottom of the pocket contains no calculus.

Fig. 14.—Enlargement of the maxillary right molars showing marked bone resorption. The periodontal membrane is markedly widened and a general haziness of the bone can be noticed. The cone of resorption can be seen at C.

Fig. 15.—Enlargement of the mandibular left molar region of the same case as Fig. 12.

Although salivary calculus is usually present, it is not the cause of the pocket formation but is responsible for the persistent inflammation that results in the later stages.

Pain is not a feature in parodontosis. When the roots of the teeth are exposed due to collapse of the gingival margin, however, painful sensation may arise from sudden changes in temperature, irritation from fruit acids, sugar, and other sources. Pain may also result from excessive motion of loosened teeth during mastication.

The x-ray examination in a case of parodontosis is of extreme importance as the diagnosis of bone involvement in this type is best made by means of an

x-ray examination. The x-ray picture, however, should be looked upon only as an aid in diagnosis, and it should never take the place of a direct examination. The diffuse line of bone atrophy starts at the cervical part of the periodontal space, which becomes enlarged in width to the depth of the alveolus and presents the shape of a cone. The apical periodontal membrane having become

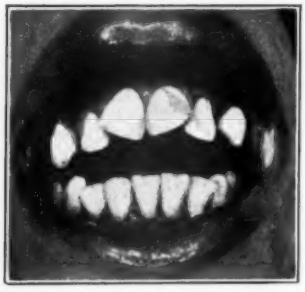

Fig. 16.—Parodontosis. This case is of a woman aged 37 years, and shows marked migration of the anterior teeth.

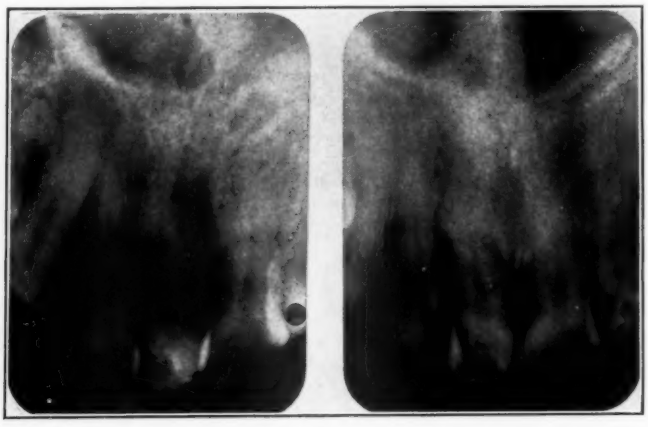

Fig. 17.—X-ray pictures of case shown in Fig. 16. Marked bone resorption can be seen.

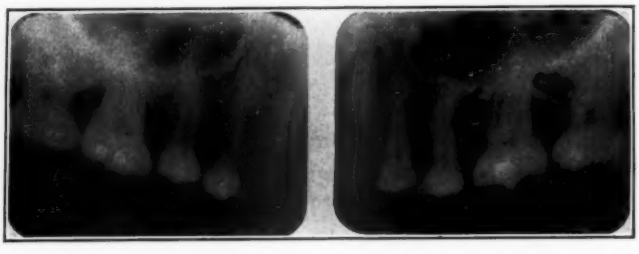

Fig. 18.—X-ray pictures of the posterior teeth in case shown in Figs. 16 and 17. Cone of resorption at C.

enlarged shows a greater radiolucent space around the apex than is normal. The x-ray picture of the alveolar bone shows a general haziness. The marrow spaces seem enlarged, and the trabeculae of the spongiosa are fine and wide-meshed.

The regular x-ray picture shows only the bone lost mesially and distally to the tooth. One cannot tell about the bone lost on the buccal and lingual sides,

nor the depth of the pocket, since the soft tissue does not show in the x-ray picture. A procedure that we have followed to denote pocket depth is to place gutta-percha points into the pockets to the greatest depth previous to x-ray examination (Fig. 11). The angulation of the cone, the milliamperage, the

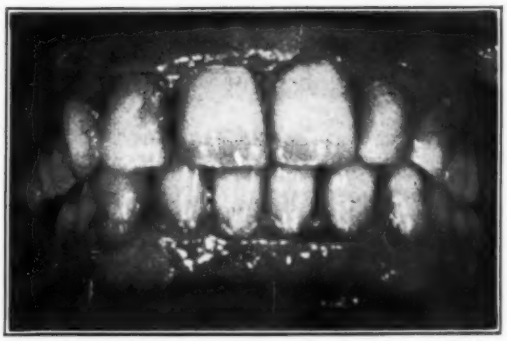

Fig. 19.—Syndrome. This is a case of a young woman aged 30 years; early parodontosis and marginal parodontitis are both present. The patient complained of bleeding of the gums and of the drifting of the maxillary right lateral incisor. She had had marked pain in this tooth and had visited a dentist who removed the pulp, and root-filled the tooth although there was no cavity present. The pain, however, did not disappear. Upon examination a marginal parodontitis was found. The gingiva were bluish red and inflamed. Upon pressure pus exuded. Vertical pockets were found around some of the teeth. There was a deep vertical pocket on the lingual surface of the maxillary right lateral incisor, and this pocket was filled with granulation tissue. Upon removal of the granulation tissue the pain disappeared. X-ray examination showed resorption of the alveolar bone throughout the mouth with increase of width of the peridental membrane. With the drifting of the lateral and vertical pockets present, a diagnosis of syndrome was made.

Fig. 20.—X-ray pictures of case in Fig. 19, showing gutta-percha points placed in the pocket. The patient was feeling pain from the abscessed condition at *A*, since upon removal of this condition the pain disappeared. This tooth was unnecessarily root-filled because of the improper diagnosis by the patient's previous dentist.

voltage, and the exposure time should be recorded in order that the same exposure can be duplicated at a subsequent examination. This method will tell the exact depth of the pocket and gives an accurate record so that after treatment, by taking another x-ray picture with a point in place, we can ascertain whether we have obtained reattachment.

SYNDROME OF MARGINAL PARODONTITIS AND PARODONTOSIS

Three combinations of marginal parodontitis and parodontosis have been described in a previous paper, and called a syndrome. The syndrome may develop (1) in a long standing case of marginal parodontitis wherein parodontosis sets in; (2) in cases where marginal parodontitis and parodontosis develop at the same time; and (3) in cases of advanced parodontosis in which the marginal parodontal structure succumbs. These combinations are very important to diagnose correctly for, if not recognized, treatment will not likely be successful and prognosis will be less favorable. It can easily be seen that if we treat a case for late marginal parodontitis without recognizing that parodontosis is also present, the result will not be favorable.

Because it is so extremely difficult to diagnose these combinations correctly, as one condition overshadows the other, and so many factors are present at the same time, one must observe the symptoms as closely as possible. For example, in a patient who has been afflicted by the local type of marginal parodontitis the systemic condition may change and cause the pathologic changes of parodontosis to set in. In such a case the subjective and objective symptoms of the marginal disease will overshadow the systemic parodontal condition. X-ray examination is the best aid in diagnosis. A careful study of the bone structure and alveolar resorption at the alveolar crest and apex should be made to ascertain the presence of signs of parodontosis. Clinically the wandering of the anterior teeth and any disturbance of the occlusion should be noted. The type of pocket formation should be investigated, and not until all symptoms have been evaluated should a diagnosis be made.

In cases where local treatment does not bring the results to be expected, the condition should be reinvestigated to determine the possibility of a systemic influence.

SUMMARY

These studies show that a correct diagnosis is important in parodontal disease, but not easy to obtain. We must bear in mind that several conditions may exist simultaneously and that we should be on the watch for them.

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EPITHELIAL INLAY IN DENTISTRY

J. F. S. Esser, Monaco

BEFORE specializing in structive surgery, I deemed it essential to study dental surgery. That study has been of the greatest service to me, and probably without it I should not have developed my method of epithelial inlay.

In structive surgery this method has proved to be of such great practical value that it is daily used by structive and plastic surgeons all over the world. After twenty years, the technique of this method has become so perfected that its application today in dental surgery is inevitable.

For the epithelial inlay an exact mold is made, with stent's mass, of wounds for which free skin grafts are to be used. The areas may be of any size, as plenty of thin skin is available on both thighs; or, if only small pieces are wanted, they may be taken from the inner side of the upper portion of the arm.

The mold of the wound is covered with a skin graft with its outer side toward the mold. Then the mold is placed on the wound for one week, exactly as when it was made. Firm pressure on the mold toward the wound prevents the accumulation of any secretion between the wound and the graft. By any other method this secretion partly or entirely loosens the already attached graft. If the technique of making the epithelial inlay is carried out correctly, the graft heals completely. Although I have made many hundreds of epithelial inlays, I have considered it unusual if the graft failed to "take" when the stent mass was removed after a week. The wounds of the thigh or arm heal in a few days under a dry dressing or one treated with petrolatum. The dressings are left on the wounds until they become displaced of themselves.

TOTAL RECONSTRUCTION OF THE NOSE AND/OR THE FACE WITHOUT INCISION OF THE SKIN

There are several mutilations of the nose which generally necessitate many difficult and complicated operations, leaving the face very much scarred. These mutilations can be repaired by one large epithelial inlay without any incision in the skin of the face. These deal in the first place with very pronounced cases of saddle nose, which are sunken deeply and fixed by scars. These patients cannot be helped by the mere grafting of cartilages and bones to make a new skeleton framework for the nose, because an insufficient supply of mobile skin is available to form a normal nose. The two cheeks are united by a flat scarred skin bridge; these cases may originate from syphilis or other diseases or from any kind of mutilation.

I published a long article on plastic work on the nose without skin incision in *Deutsche Zeitschrift für Chirurgie* in 1921 under the heading "Nasenplastik ohne Hautschnitt." That article encouraged many plastic surgeons to practice the method, with such success that they have since published numerous articles

and have given many lectures showing the amazing results obtained by one simple operation. Gillies and Kilner particularly made my method more universally known in the United States and in England; while I have done likewise in Germany and in central Europe.

Until now my method has been known and practiced only by plastic surgeons, but the time has come for it to be introduced into oral surgery.

The method consists of making a long incision in the mouth alongside the entire fornix, penetrating deeply under both cheeks and undermining them as far as the orbitalia. This incision extends from one cheek to the other, passing through the inside of the nose. It is immaterial whether there is a septum or not. If there is a septum, it can be cut either with a strong knife or with scissors.

The loosening of the cheek and nose tissues from the jaw is carried out as far as possible with a blunt instrument, but scars necessitate frequent cutting. Now all the soft parts of the face can be lifted by a Langenbeck or other large metal hook. After this a large stent mold of the pocket is taken from the incision in the mouth. The purpose of this mold is to lift the skin of the nose as high as possible, utilizing for this purpose a large portion of the skin of the cheeks, which is very elastic. The mold must assume, in its center, the natural form of the nose, and when it is stiff it compels the skin to follow this form. In this manner the features of very much disfigured patients immediately appear normal, but if scars occur, I prefer to exaggerate greatly the form of the nose because the scar tissue inclines to retraction.

The mold is then removed and entirely wrapped in thin Thiersch grafts; the outer side is then replaced in the pocket in exactly the same position as it was when taken. It remains thus for a week or, better still, two weeks, firmly fixed so that it is unable to move. It may be fixed underneath by very long bow-shaped metal sutures perforating both cheeks and passing over pads of gauze or lead plates.

If dentists assist in the carrying out of this operation, it is preferable for the stent mold to be fixed and held by a dental prosthesis or a metal apparatus passing through the stent and fixed on the teeth. It must be applied in the following manner: Its upper part, which must enter the pocket, is wrapped in a piece of soft stent, one-third the size of the definite mold. This stent must form a hard kernel around which the soft stent of the future mold can be introduced into the pocket. The dental apparatus is then applied to the teeth or to the jaw in the same position it must later keep when the mold, covered with skin, is definitely placed in the pocket.

After two weeks the mold is removed, and the pocket will be completely epithelialized if no mistake has been made in the technique. Next, a new dental apparatus is introduced, which keeps only the skin of the nose in the desired natural position. This apparatus must be small and simple. If the anterior teeth are present, metal bands or caps are attached to them, and these are soldered together with a metal thread the size of a knitting needle, going through the fornix to the tip of the nose and terminating there in a pea-shaped piece

of metal. Sometimes it must be shaped differently if it has to support the whole bridge of the nose, but the patient's appearance is already quite normal because the apparatus scarcely shows. If the patient so desires, he can retain this apparatus, but he usually prefers bone or cartilage grafts so that he can dispense with it.

Fig. 1. Fig. 2.

Fig. 3. Fig. 4.

Figs. 1-4.—Case 1.

The following cases illustrate the results of the method; the photographs have been taken before and after the operation.

Case 1.—Figs. 1 and 2 show the patient before the operation. Fig. 3 shows a headcap of plaster of Paris containing a metal apparatus which entered the patient's nose to keep the nose in the desired position after the mold was removed and until the definite support of the nose had been formed. Fig. 4 shows the final result.

Case 2.—Fig. 5 shows the patient as he came to me for treatment. Fig. 6 shows the final result.

Gaps in the palate can be healed by rather small biological angular flaps.* These can be brought to the palate either through the mouth or through the nose. If teeth are missing on the side from which the flap is taken, it can pass through this gap; otherwise the mouth must be kept open for a week to enable the pedicle to pass between the rows of the teeth. If the flap and the pedicle are small, they can approach the gap in the palate through the entrance of the nose. If they are too large for this, an incision can be made in the line between nose and cheek in order to enlarge the entrance to the nose.

The edge of the hole in the palate is freshened by cutting away its epithelial cover. The flap being introduced into the nose appears in the gap of the palate where it is sewn to its borders in the mouth. After healing, the pedicle is cut through, drawn back and replaced in its original position. The wound side of the flap showing in the gap of the palate was covered by epithelial inlay, immediately after the flap had been sutured to the borders of the gap. This epithelial inlay had been kept pressed against the palate by a dental apparatus.

Fig. 5. Fig. 6.

Figs. 5 and 6.—Case 2.

Case 3.—The patient had been operated on elsewhere for resection of the left maxilla because of cancer. Figs. 7 and 8 show the patient as he came to me. Fig. 9 shows clearly the defect of the maxilla. The entire separation between nose and mouth was reconstructed by means of an enormous angular flap 4 by 1½ inches (see sketches in Figs. 12 and 13). Figs. 12 and 13 show the flap *A-C-D*, which before being cut had its upper part epithelialized by epithelial inlay. This epithelial inlay was introduced behind the future flap through an incision *B-C*. After the healing of the epithelial inlay, the flap *A-C-D* was cut and the incision *B-A* was deepened until it entered the mouth. The flap was then introduced into the mouth through incision *A-B* and, being rather massive, filled the gap, wholly separating the nose from the mouth. The portion epithelialized by the inlay completed the inner side of the nose.

The secondary gap between cheek and nose, though very large, could be sewn together without tension, as there was an abundance of cheek skin (see

*Esser: Biological Flaps, Ed. Brill, Leiden, Holland. Idem: Articles in Revue de Chirurgie Structive, Brussels.

Fig. 7. Fig. 8. Fig. 9.

Fig. 10. Fig. 11.

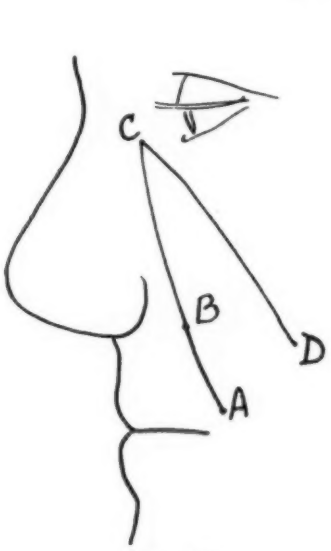


Fig. 12.

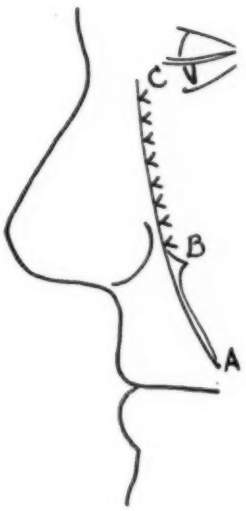


Fig. 13.

Figs. 7-13.—Case 3.

sketch in Fig. 13). After this operation the patient was better looking and appeared younger than before. Fig. 11 shows the missing jaw completely reconstructed.

Case 4.—Patient had a very large defect in the palate (Fig. 14). Figs. 15-17 show the result after the angular flap has closed the gap in the palate. The scar in the middle of the cheek on Fig. 16 was not caused by the operation. A

Fig. 14. Fig. 15.

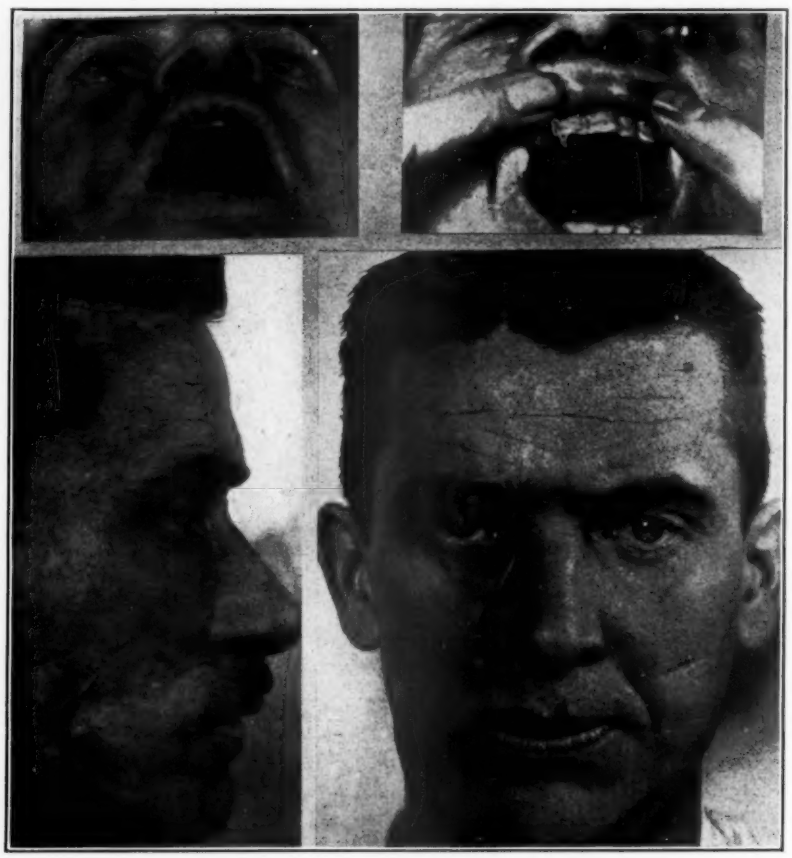


Fig. 16. Fig. 17.

Figs. 14-17.—Case 4.

slight correction had to be made (see Fig. 17), but it is remarkable that such large angular flaps can be removed without disfiguring the face. The portion of the flap which had to be placed in the gap toward the nose was first covered by epithelial inlay.

The above described cases presented no difficulty, as the flaps could easily enter the mouth; the next case, however, was more difficult because the dentition was complete and the flap had to be placed between the two rows of teeth. The mouth had to be kept open by a dental apparatus during the whole period of healing.

Case 5.—Fig. 18 shows a small hole in the palate, but a large surface surrounding it was scarred. In spite of numerous attempts made by others no successful result had been obtained. Fig. 19 shows the angular flap placed in the mouth but still pedicled. The scarred tissue was removed, and a large flap was healed on the whole defect, both hole and surrounding tissue (Fig. 20).

Fig. 18. Fig. 19. Fig. 20.

Figs. 18-20.—Case 5.

Fig. 21. Fig. 22.

Figs. 21 and 22.—Case 6.

Case 6.—Fig. 21 shows the still pedicled flap; secretion crusts are seen around the sutures of the secondary gap. I never place any bandage on wounds of the face. Twenty years ago I introduced the method of dusting the skin with a very thin layer of calomel powder, which causes no irritation and disinfects any secretion, the skin remaining dry and keeping its natural temperature. Fig. 22 shows the large flap repairing the large hole in the palate, the back portion toward the nose having previously been covered by epithelial inlay.

In cases in which, because of various reasons, the mouth is not sufficiently large, an epithelial inlay is made, passing through the whole cheek and forming an epithelialized canal on the spot to which the future edge of the mouth must be. Several weeks later the bridge between the canal and the existing edge of the mouth is cut, the edge of the mucous membrane is sewn to the border of the skin, and the mouth will have acquired the desired size and shape and will have no tendency to become smaller again. In any other method to enlarge the small

Fig. 23. Fig. 24.

Figs. 23 and 24.—Case 7.

scarred mouth, the mouth would again become smaller by retraction of the scars; but here the new canal, fixed before the enlargement of the mouth, remains in place.

Case 7.—In Fig. 23 is seen the result of the epithelial inlay, a metal pin passes through the canal. Fig. 24 shows the mouth after cutting of the bridge. In many cases the mucous membrane is not mobile enough to be easily sewn together with the skin, without changing the natural line of the mouth. In such cases a second epithelial inlay is applied on the fresh cut of the bridge.

CALCULUS IN SUBMAXILLARY GLAND AND WHARTON'S DUCT

THOMAS R. PALMER,* D.D.S., GREYSTONE PARK, N. J.

PATIENT, N. B., colored, age 66 years. Edentulous except for lateral incisor, canine, and first and second premolars. X-ray examination disclosed a large mass in the right submaxillary gland. This mass was easily found on digital examination, moveable, and the area slightly painful. Diagnosis: Calculus in submaxillary gland and Wharton's duct.

Fig. 1. Fig. 2.

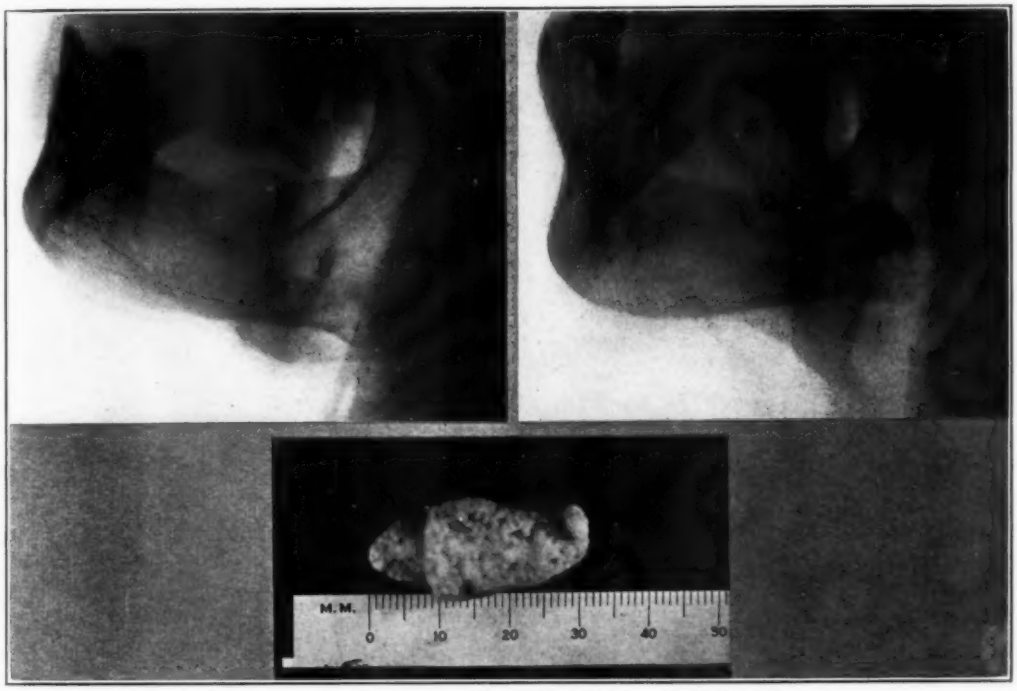


Fig. 3.

The floor of the mouth was anesthetized by injection of novocaine and adrenalin for an area of approximately 1 × 1½ inches directly over the mass. Incision was made in the floor of the mouth near the mandible, slightly posterior to normal position of the third molar; blunt dissection was made until the covering of the gland was found. The entire mass was picked up with mouse-tooth forceps and held in position and an opening made to uncover the calculus. Forceps were introduced and the calculus was grasped inside the soft tissue; the opening was enlarged as much as necessary, and the mass was removed with no disturbance of the gland tissue.

*Senior Resident Dentist, New Jersey State Hospital.

The wound was not sutured, as the edges occluded. The cavity was thoroughly irrigated with normal salt solution, and iodine was applied. A small drain was inserted, which was changed daily for four days, then removed and an uneventful recovery took place.

The calculus itself weighed 4.25 grams, was 32 mm. in length and 15 mm. in diameter.

Two months after operation recovery was complete, and there were no signs of operation and no apparent false opening of Wharton's duct.

Case Reports

Dr. William H. Hyde has furnished the editor with a number of cases of incisive canal cysts, which will be discussed this month. Readers are invited to send to the editor interesting cases of their own and to discuss published cases. Send histories, x-ray pictures, and photomicrographs to Dr. Kurt H. Thoma, 47 Bay State Road, Boston, Mass.

CASE REPORTS NOS. 16 TO 18

INCISIVE CANAL CYSTS

WILLIAM H. HYDE, D.D.S., F.I.C.A., BROOKLYN, N. Y.

CASE NO. 16

The patient, male aged 35 years, married, born in China, yellow race, a restaurant owner, presented himself at my office on November 23, 1937.

Complaint.—He had complained to his physician of a large swelling on the palate about the size of a walnut and at the same time encountered a great deal of trouble in breathing. It seems that he could not get enough air through his nostrils and was compelled to breathe through his mouth. He also complained of a postnasal drip. He was referred to a nose and throat specialist, who found a bulge extending into the nasal cavity because the mass in the mouth was causing arching of the palate, thereby obstructing the air passages. He was referred to my office.

Examination.—A cystic swelling about 2½ inches in diameter was observed filling the oral cavity. The color was normal. Nasal examination revealed the floor of the nose arched. The mass was in the midline. A full complement of teeth was found normal to the pulp test. There was no adenopathy; lips, cheeks, and tongue were negative. The mucous membrane of the mouth was normal in color and in texture.

X-ray examination revealed a large cyst in the median line of the palate, diagnosed as incisal cyst (Fig. 1).

Treatment.—The mass was removed under novocain anesthesia. The sac was much thinner than in the case of other cysts and was firmly attached centrally. The periphery of the cyst was loosely attached. The aspirated fluid consisted of red blood cells, leucocytes, cholesterol crystals. Culture on blood plates gave no growth.

Pathology.—(Dr. Thoma.) Microscopic examination showed a fine cyst membrane practically complete except in one place where there was considerable hemorrhage which was probably due to the operation. This membrane consisted of almost parallel layers of collagen fibers with occasional fibroblasts

and blood vessels. They seemed to be more or less separated by spaces and were probably due to edema. The inner surface was lined by multiple layers of flattened epithelium, loosely connected so that the intercellular bridges became an outstanding feature, and the intercellular spaces contained an occa-

Fig. 1.

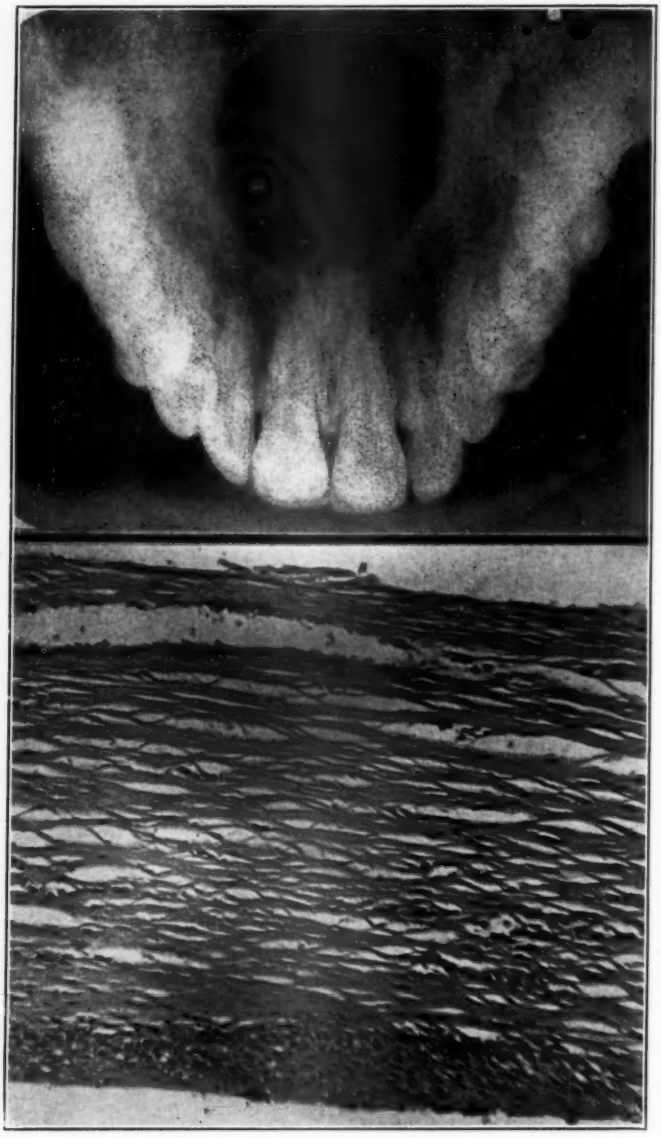


Fig. 2.

sional inflammatory cell. There was some evidence of desquamation, individual squamous cells being contained in the lumen with a great abundance of red blood cells that seemed partly attached to the cyst wall. These again could be ascribed to operative interference. At one place the cyst wall was greatly thickened, and there numerous rhomboid spaces were seen in the connective tissue, which were due to cholesterol crystals dissolved out. These

crystals in some instances seemed to be surrounded by large foreign body giant cells. The microscopic picture was consistent with incisive canal cyst (Fig. 2).

Results.—Uneventful recovery ensued. Nasal passages became clear, mouth-breathing disappeared, the arch of the palate returned to normal curvature. Speech became normal.

Case Report No. 17

Patient, M. O., female, white, born in Russia, aged 46 years, housewife.

Complaint.—Patient noticed a small swelling in the roof of the mouth with pain of two weeks' duration, due to irritation. Painting with iodine had brought no relief, so she went to her dentist, who referred her to me. The swelling had been present as long as she could remember.

Examination showed a rounded mass in the roof of the mouth, one-fourth inch beyond the gingival margin of the incisors, and about one-fourth inch below the level of the roof. The covering mucosa was red and edematous, and tender to touch.

Fig. 3.

X-ray examination revealed a rounded, circumscribed, radiolucent area about 5/8 inch in diameter with the incisal foramen in the center (Fig. 3).

Bacteriologic Examination.—A few Vincent's organisms were found.

Diagnosis.—Incisal cyst with secondary inflammation of the wall.

Treatment.—Alkalol and acriviolet mouth washes with acriviolet paint were used, and the inflammation cleared up in eight days.

Under local anesthesia with procaine and epinephrine (1:25,000), the sac was removed in one piece. The wall was adherent to both the underlying bony wall and the covering mucosa, but was easily detached. The fluid showed the typical shimmering crystals of cholesterol, and was negative on culture.

Pathology.—The wall consisted of fibrous connective tissue with scattered masses of small round cells. It was lined with squamous epithelium.

Result.—Uneventful recovery.

Case Report No. 18

J. L., aged 56 years, white, born in the United States, unemployed, presented the following condition.

Complaint.—Intermittent pain for the past ten years, localized in the palate and both sides of the maxilla. Also he complained of the presence of a "ball" in his mouth. There was difficulty in chewing; the "ball" got in the way of the food.

Examination showed a round mass, projecting from the hard palate in the midline about one-half inch behind the incisors. It was firm to touch and pres-

Fig. 4.

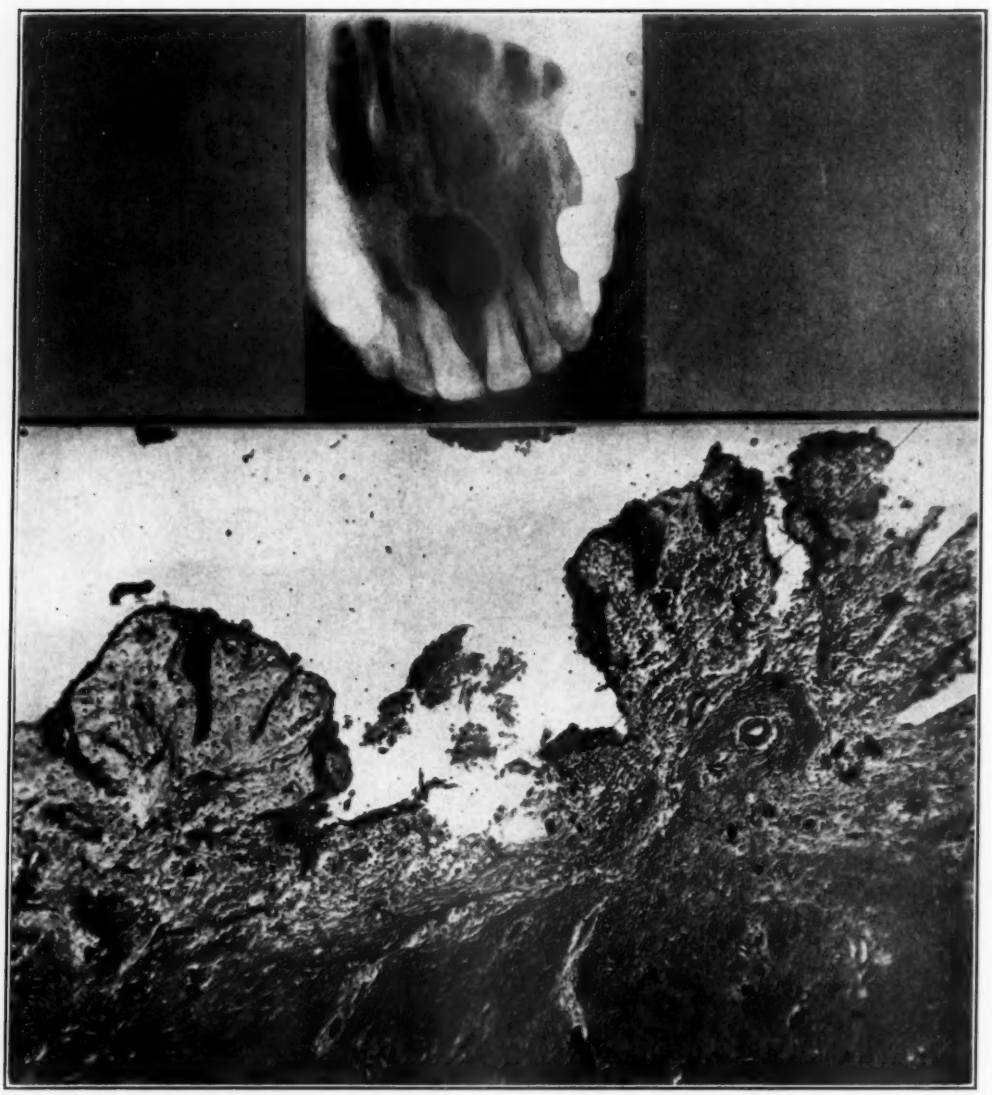


Fig. 5.

sure and caused pain. It was about three-fourths inch in diameter. The mucous membrane over the cyst was normal in color. The first molars of both sides were missing. The remaining teeth were normal to the pulp tester. There was no adenopathy. The rest of the oral cavity was normal.

X-ray examination revealed an oval radiolucent area in the midline of the hard palate, just behind the incisors, with a cystic margin (Fig. 4).

Diagnosis.—Incisal cyst.

Treatment.—Under novocaine anesthesia the mass was removed in its entirety. The sac was firmly attached to the palatal mucous membrane. The sac wall was thick, and on examination the thickened contents were found to consist of sterile fluid.

Pathologic Examination.—(Dr. Thoma.) Microscopic examination showed the sac to consist of a thick membrane made up of dense irregularly arranged collagen fibers containing a large number of fibroblasts and some inflammatory cells. There was a thick layer of epithelium which showed evidence of downward growth. There was considerable inflammatory infiltration in the subepithelial region. The peripheral side of the sac was lined with trabeculae of bone. In some places the surface showed papillomatous outgrowths into the lumen (Fig. 5).

Result.—Uneventful recovery.

Department of Orthodontic Abstracts and Reviews

Edited by

Dr. Egon Neustadt, New York City

All communications concerning further information about abstracted material and the acceptance of articles or books for consideration in this department should be addressed to Dr. Egon Neustadt, 133 East Fifty-Eighth Street, New York City.

Bacteriology for Dental Students. By Arthur Bulleid, Dental Surgeon and Lecturer in Special Bacteriology to the Dental School, Guy's Hospital. St. Louis, 1938, The C. V. Mosby Co.

This book has two main purposes: first, to provide the dental student with a concise volume from which he may gain sufficient knowledge in general bacteriology to serve him as a background for bacteriologic study in his own special field; second, to supply him with sufficient information, in a theoretical and practical aspect, for the application of these general principles to dental and mouth bacteriology.

It is interesting to note that, from its very beginning, the science of bacteriology was closely associated with dentistry. The Dutchman, Anthony van Leeuwenhoek, who had become an expert in grinding lenses, constructed a sort of microscope by means of which he could study objects smaller than anything that had been seen before. One of his first bacteriologic examinations was carried out on tartar scraped from teeth, and this discovery was presented to the Royal Society of London in the year 1683. It was not until the latter half of the nineteenth century, however, that the relationship of bacteria to infectious diseases was established by Louis Pasteur. Later on, Metchnikoff carried the knowledge of bacteriology a step farther in his study of immunity and the defense of the human body against microorganisms. Finally, Julius Cohn of Breslau described the forms and movements of bacteria and drew up his classification which gave him the name as founder of bacteriology.

In the general part of the book, the author deals with the classification and morphology of microorganisms, and discusses their biologic requirements as to food supply, moisture, and temperature. In conjunction with this phase follows the chapter on sterilization and disinfection.

The practical side of bacteriology covers various laboratory methods: staining principles, microscopic examination methods, and the preparation of media and cultures.

The special (dental) part of the textbook deals with methods of isolating bacteria from dental lesions and their investigation (in such conditions as gingivitis, gum lesions, Vincent's angina, thrush, pyorrhea). Comprehensive chapters are devoted to the bacteriology of caries, to apical infections, to cultures from the apices of pulpless teeth, and to the examination of the

tooth pulps "live" and "dead." A detailed description is given of those microorganisms which are usually found only in the mouth. The examination of the blood in connection with dental diseases is considered of extraordinary importance. A careful red cell and white cell count, a hemoglobin estimation, and a differential count are a valuable guide to the dental and general conditions, and an important aid in treatment.

Leading again from the special field of mouth bacteriology to more general considerations, we find the author discussing the interesting problems of susceptibility and immunity to infection (vaccines, antisera, etc.) and the whole complex mechanism which nature employs for the protection against bacteria.

This volume is well classified and illustrated. Its most outstanding feature is the fortunate manner in which the author has combined a scientific approach with intelligible presentation.

Egon Neustadt

The History of Dentistry in Missouri. Material compiled and published under the direction of the History Committee of the Missouri State Dental Association (Edward E. Haverstick, B. E. Lischer, T. E. Purcell, R. J. Rinehart, and W. B. Spotts), Fulton, Missouri, 1938, The Ovid Bell Press, Inc.

This book comprises a brief summary of early dental history, American dental activity, and the advance of dentistry in Missouri. It includes a survey of the dental organizations within the state, their code of ethics, dental laws, and local publications. It contains biographical notes of the founders, of the presidents of the Missouri State Dental Association, and of dentists from the districts outside the St. Louis and Kansas City districts.

This volume is dedicated to the pioneers of Missouri dentistry—men of high ideals, lofty purposes, and sound principles, who laid the foundation of dentistry in the Middle West. It should inaugurate an era of interest in the historical background of dentistry that will exert a most beneficial influence upon the development of the dentistry of tomorrow.

In the foreword Dr. L. Pierce Anthony says: "And certainly nothing could be more fitting than that the dentists of Missouri should do honor to dentistry's pioneers of the West by elaborating upon and recording their lives in a permanent historical record. It was this section that constituted the cradle of dentistry of the West, and it was in this section that dentistry received a great developmental impetus at the period just previous to the actual elevation of the practice of dentistry to the status of a profession."

While *The History of Dentistry in Missouri* has for its particular objective the recording of the noble deeds of the dentists of Missouri and the immediate environs, the record here assembled constitutes in reality a rather comprehensive history of the development of dentistry in the United States. It contains some very interesting highlights on the practice of dentistry in ancient times and a record that furnishes a heretofore unrevealed insight into some of the reasons why dentistry developed along the line that it did; namely, as an autonomous profession, distinct and separate from medicine.

Editorials

Presentation of the Albert H. Ketcham Award at the Meeting of the American Association of Orthodontists in Los Angeles, 1938

DR. ALFRED PAUL ROGERS of Boston was presented with the Albert H. Ketcham Memorial Award at the meeting in July of the American Association of Orthodontists in Los Angeles. This award was made to Dr. Rogers for his outstanding contributions to orthodontic progress in advancing the principle of myofunctional therapy. In presenting the award, the late Dr. B. Frank Gray of San Francisco presented a paper entitled "The Albert H. Ketcham Memorial," explaining in detail the background and the policy of the Committee which has charge of the presentation of this award.

The Albert H. Ketcham Memorial

It might well be said that there are two stages in a man's career: First, those years when he walks and works among us in the flesh; and, second, those years when having departed from the world of material activities he lives among us in spirit, his good works still following him.

Albert Ketcham led so useful a life that I am entirely sure the duration of the second period to which I refer will very far exceed the years of his sojourn on earth.

Removing from the Eastern seaboard not long after graduation from Tufts Dental School, he found himself a seeker for health in the mountains of Colorado. Those all too precarious days extended themselves into months, if not years. His strong spirit, however, accepted no defeat. Eventually he was established in dental practice in Denver, where he was destined to labor so long and so successfully.

Dr. Ketcham's acquaintance with Dr. Edward H. Angle, whose student he became, was the circumstance which brought together two men, widely differing in temperament, but each equally energetic in defense of his ideals. Both teacher and student found in each other a common ground of inspiration. At one time, following Dr. Ketcham's entrance upon the special practice of orthodontics, Dr. Angle stated he believed he was doing the best work of any of his students. Indeed, orthodontics became the lodestar of Albert Ketcham's very existence. It seemed to be the moving impulse of his every waking moment. He was not content with the conventional routine of orthodontic practice. Nothing short of the best from his highly developed skill and thought would bring him satisfaction. His goal was an ideal of excellence, the attainment of which he was eager to pay for at any cost of time and energy.

Dr. Ketcham's offices in the old Mack Building and later in the Republic Building in Denver became the mecca of visiting orthodontists from all parts of the United States. No man more freely dispensed hospitality than did he.

His large practice was so well organized that he was always ready to take the visitor into his offices and demonstrate to him clinically the processes he employed in his work. His office became a veritable seminar of orthodontic instruction, open to all comers.

Albert Ketcham's contributions to the science of orthodontics were numerous and covered a period of many years. He became proficient in the use of all the appliances developed by Dr. Angle, doing especially fine work at one time with one of the most demanding of them, the pin and tube appliance. He later developed certain appliances of his own and used them with much success. He did much to emphasize the vital importance of radiography in orthodontic practice. Radiographic records early became routine in his office, and the beautiful work both in radiography and in photography attested his painstaking skill and became an inspiration to all.

Root resorption claimed an important place in his studies, as the literature attests. Beyond doubt, his work along this line was of great benefit. Albert Ketcham contributed richly to the literature of orthodontics. His writings were painstakingly prepared and were in a large degree the result of his own observations rather than theoretical treatises or the reiteration of the work of other authors. While ready to listen to others and accept what was logical, he was constantly striving to evolve better methods of doing things than had yet been devised.

The physical handicaps from which he suffered were subordinated to his work, and he progressed toward the goal of excellence he had set for himself in spite of these hindrances. If he must work beset with pain and dimmed eyesight, these were but incidents that must be lived above.

At the death of Albert Ketcham, the American Board of Orthodontia set itself the task of establishing a memorial in his honor. It was decided that it should take the form of an annual award, to which the recipient might well aspire. The project was made possible through the generous contributions of members of the American Society of Orthodontists.

The remaining paragraphs of this short paper are from the minutes of the American Board of Orthodontia and explicitly set forth the purpose and administration of the memorial.

"In the passing of Dr. Albert H. Ketcham on December 6, 1935, our profession sustained an irreparable loss. As one of the pioneers in orthodontia, he helped blaze the trail into unexplored realms of science, doing his work so well that the burdens of those who were to follow were greatly lightened. As a student and investigator, his wisdom and judgment brought benefits to humanity and general helpfulness to his fellow practitioners.

"No man ever gave more generously of his time, effort or ability for the advancement of the specialty of orthodontia than did Dr. Ketcham. Handicapped, as he was, for forty years by many physical disabilities, he never faltered in his exacting labors, nor did his interest flag.

"As the first president of the American Board of Orthodontia, a position he held from the inception of that organization in 1929 until May, 1935 (and continuing as a member of the Board to the end), his wide experience and mature counsel went very far to bring success to this new and important activity in our profession.

"To commemorate his splendid achievements, and to serve as an inspiration to the advancement of orthodontia, the American Board of Orthodontia hereby creates THE ALBERT H. KETCHAM MEMORIAL.

"The material symbol of this memorial shall consist of an illuminated parchment, appropriately inscribed, the same to be awarded annually (in perpetuity) to some orthodontist or other person who, in the judgment of the Award Committee, has made a notable contribution to the science and art of orthodontia during the then current year, or during some previous period.

"The Award Committee shall consist of five members, namely: the president, the president elect, and the vice president of the American Society of Orthodontists; the remaining two members to be appointed annually by the American Board of Orthodontia.

"To defray the expenses involved in the preparation and administration of the memorial, contributions are being received from the orthodontists of the United States and other countries. The aggregate sum so received shall be invested in first-grade securities or in an interest-bearing savings account, such investment to have the unanimous approval of the American Board of Orthodontia.

"In the event that the American Board of Orthodontia should cease to function, the Albert H. Ketcham Memorial is to be administered by the American Society of Orthodontists, or by its legal successor.

"Should the organizations named above become nonexistent, or should the administration of this memorial lapse for a period of years, the principal amount of the fund with accumulated interest shall be devoted to the preparation of a suitable permanent memorial to be set up in an appropriate location in the city of Denver, Colorado."

B. Frank Gray.

REMARKS OF FRANK M. CASTO, PRESIDENT OF THE AMERICAN BOARD OF ORTHODONTIA, IN PRESENTING THE AWARD TO DR. ALFRED P. ROGERS.

Dr. Gray has just informed you the reason for the foundation of the Albert H. Ketcham Memorial and stated its purpose, which, if I may repeat, is to make an award each year to a person who has made a notable contribution to the science and art of orthodontics. This year the Award Committee, composed of two members of the American Board of Orthodontia and three members of the American Association of Orthodontists, in their wisdom selected Dr. Alfred Paul Rogers upon whom to confer this honor. It is unnecessary for me to speak at any length upon the professional activities and accomplishments of Dr. Rogers. His record is written indelibly in the annals of orthodontics, there to remain in mute evidence of his splendid achievements.

Dr. Rogers was graduated from Dental College in 1896. He entered with a far better educational background than did most students at that time. The additional education than that required for entrance enabled him to gain a broader concept of dentistry, which soon asserted itself in the many professional and scientific activities in which he engaged. He attended the course of the Angle School of Orthodontia given in 1903 and began the practice of

orthodontics as a specialty in Boston in 1906. Dr. Rogers has made many valuable contributions to the science and art of orthodontics, which have enriched its literature. Perhaps his most outstanding contribution has been made in advancing the principle of myofunctional therapy. This really need not be discussed, for you had the privilege of hearing his splendid presentation yesterday. I shall, however, quote in part from an editorial in the *Medical Times* of January, 1930:

"The man who found orthodontics an art and made of it a science as well is Dr. Alfred Paul Rogers, D.D.S., A.M., of Boston, who in 1918 promulgated the fundamental principle of the new dispensation. His original article on the treatment of malocclusion by the invocation of 'Living Orthodontic Ap-

Directors of the American Board of Orthodontia. Standing, left to right: Dr. William E. Flesher, Dr. Frederic T. Murless, Jr., Dr. Harry E. Kelsey. Seated, left to right: Dr. Charles R. Baker, Secretary; Dr. Frank M. Casto, President; the late Dr. B. Frank Gray, Vice-President; Dr. Bernard G. DeVries, Treasurer.

pliances' was truly of an epic-making character, worthy to rank in its thorough breadth and depth of insight with other classic contributions in the field of medicine."

Dr. Rogers has been honored many times by the societies to which he belongs. He was president of the American Society of Orthodontics in 1911. He is a past president of the American Academy of Science, and is this year president of the New York Society of Orthodontists. I have mentioned only a few of the highlights in the professional career of Dr. Rogers. His ability as a writer is not confined entirely to the profession. As a member of a literary club in his home city, he has prepared many interesting essays on varying subjects, some of which are: "The Influence of the Climate on Civilization," "Man and His Migrations," "American Forests," "Labor and Leisure," and "Notes of a Countryman," the last having been published in book form.

I wish now to quote from a letter received from a colleague which presents a splendid insight into his personal life: "Dr. Alfred Paul Rogers, whom I am proud to call my friend, is one of the broadest, finest, most cultured gentlemen it has been my pleasure to know.

"A lover of books, he is widely read in the best literature and has written a book of essays which will enrich in mind, in heart and in soul all those who read it.

"A lover of the country, he has transformed a simple New England farmhouse into a most beautiful and attractive home, where he and his family may enjoy the grandeur of nature and where his friends who pass that way may drop in and enjoy his generous hospitality.

"A lover of trees, not content with conserving the many trees on his estate, he has planted thousands of pine seedlings which have now grown large and strong to enrich the beauty of the countryside.

"A lover of birds, he has provided many houses for their winter and summer abode, has nurtured them through the long, rugged New England winters and encouraged them to remain during the summer months.

"A lover of mankind, his fine humanitarian instinct is constantly expressed through giving alms to the unfortunate and distressed. His generosity, wisdom, and words of advice have been the means of rehabilitating many who were downtrodden and in despair.

"A lover of children, to them he is kind, gentle and considerate. It may be truly said that his professional life has been dedicated to their welfare.

"A lover of the profession, to this he has contributed sincerely and voluminously and without regard to time, effort or self-sacrifice.

"A lover of family, a loving husband, a devoted father. The home is his sacred sanctuary, where rest and relaxation are enjoyed and happiness abounds, and where life is happy and peaceful, like the freshness of the morning dew."

These are attributes sought by many, but gained by few.

You have the right, I think, to inquire how one man alone can accomplish so much. There is a perfectly legitimate explanation in the case of Dr. Rogers. In 1899 he was married to a most charming and cultured young woman, Miss Georgina May Crosby. To her, I am told, belongs the credit in large measure for the unusual success of this man. She has been his anchor, helpmate and inspiration throughout a most delightful and happy life.

Dr. Rogers, this is one of the finest privileges and happiest moments in my professional career. The duty, however, is rather a difficult one, for no matter what words one may have at his command, they are inadequate to express the feeling of love and affection and friendship for you, and for the confidence we have in you and the appreciation of your services.

I knew Dr. Ketcham for many, many years. I have known you for an equal number of years. I knew the intimate relationship between you and Dr. Ketcham. I knew the respect and esteem he had for you. I know that

if Dr. Ketcham were here upon this occasion, he would be very happy to witness you receive this honor.

It is now my pleasure and privilege to present to you this certificate, which reads: "The honor signalized by the Albert H. Ketcham Memorial is hereby conferred upon Alfred Paul Rogers. This award is annually made in recognition of valuable contributions to the science and art of orthodontia."

Dr. Alfred Paul Rogers.

With it, may I express to you the wish of your host of friends that your life abound in health and happiness and that you may continue for many years to be of service to the profession and to humanity.

I congratulate you!

Dr. Rogers' Remarks in Accepting the Award

Honors received silently and quietly are easy to accept, but honors given in this delightful, kindly manner are most difficult to accept calmly.

But in accepting this great tribute I want to say to you that because it bears the name of Ketcham it means much more to me. It is true that we were

friends, and when we speak of our friendship there comes to my mind a number of others who formed that society of friends who are no longer with us. We, who knew these men, miss them, not only during our annual meetings, but we miss them always.

For the sake of the younger men who may not have known these men intimately, I want to say a few words, for I may be of still further service to you if I can remind you of their high qualifications: J. Lowe Young, Milton Watson, Herbert Pullen, Albert H. Ketcham and Charles A. Hawley. You older men, who were their friends, as I, know what I mean when I say to this society that their memory should ever be present before you. In accepting this high honor, which indeed I feel has been too generously expressed, I ask the privilege of sharing it in spirit with those departed friends. Each one of them richly deserves the honor you have bestowed upon me this morning, and as I think of the works of these men, who helped found this great profession of orthodontics, I believe if the younger men will take heed and become familiar with the literature of the early days of this Association they will be richly rewarded. It should become a tradition of this Association that the younger men be encouraged to acquaint themselves with the pioneers, because that pioneer spirit must be the spirit that carries us through the days which are ahead. They are going to be troublesome days, because the world is thinking unscientifically; the world is thinking in an un-Christian way, and the dangers are very grave. The ideals and accomplishments of the men I have mentioned and others you may think of, Frank A. Delabarre, the man who would have stood here later in this session to accept the presidency of this society, should be models for the younger men of the society.

While I was listening to Dr. Casto so graciously telling things about me—he left out all the disagreeable things and spoke only of the best, of course that is kindly—I tried to formulate some ideas, some phrases, some words that might express my appreciation. The word "appreciation" seemed to me inadequate, and I tried the word "thankful." That seemed, in its common meaning, to be inadequate. I tested the word "gratitude" and that too seemed inadequate. Then my mind drifted back to my days in college when my old Greek professor (a fine old man he was) taught us that the ancient Greek philologists coined beautiful words for beautiful things, making one word express the idea of a whole phrase, and I thought if I could have my old professor here he might pronounce the word that would show my feeling. The pronunciation of that word is beyond me, but the Greek philologist could take the essential meaning of "appreciation," "thankful," "gratitude" and put them all in one beautiful sounding word. You will understand my meaning when I say that in the generosity of your imaginations you may be able to coin that word and understand my feeling this moment.

Dr. Edmund H. Wuerpel, Orthodontic Mentor, Retires

PROBABLY no other one individual has contributed more to the esthetic and artistic aspect of orthodontic practice during the last quarter of a century than Dr. Edmund H. Wuerpel, retiring director of the School of Fine Arts of Washington University.

Dr. Wuerpel is a well-known figure in orthodontic circles throughout the United States, and it will be of interest to orthodontists to learn that, after spending forty-four years as a member of the teaching staff of the School of Fine Arts of Washington University, where he has been the Director since 1909, Dr. Wuerpel, at the age of 72, has retired. His career has been that of a great artist and teacher. He has been an inspiration to thousands of students who have passed under his tutelage, and he has left a definite imprint upon the specialty of orthodontics while it has been in the making. For many years he conducted courses in art at the Angle School of Orthodontia, and he has appeared on the programs of various orthodontic societies throughout America.

Dr. Wuerpel is the man whom the late Dr. Edward H. Angle sought out, many years ago, to help him solve orthodontic problems and to assist in finding some of the "missing links" in the esthetic approach to the subject. Not satisfied with the strictly mechanical perspective to the subject at that time, Dr. Angle invited Dr. Wuerpel to lecture to his students in order to broaden the students' perspective of the orthodontic problem. Dr. Wuerpel described this historic incident in the following words: "For five years I gave those students 'rules,' but they were not the rules that Dr. Angle had dreamed of. Dr. Angle quickly came to the conclusion that he would have to learn something about art—that was the sort of mind he had. After the first week of my lecturing, he came to me one day and said, 'Do you know that I really have no business teaching these students when I know nothing about some of the things that pertain to the subject? You, Dr. Wuerpel, have opened a road to me that I have never explored before. I know nothing about this business, but I want to know. Will you tell me?' And I gladly agreed, 'I will tell you as much as I can.'"

Since that time Dr. Wuerpel has been lecturing and, as he puts it, "preaching" to orthodontists. At the meeting of the American Dental Association in St. Louis this fall he will lecture again before the orthodontic section of that body.

Long and gratefully will Dr. Wuerpel be remembered by orthodontists as having contributed much to the specialty of orthodontics. He has supplied the missing link between the purely mechanical and the biological phases of this specialty, in showing orthodontists the artistic viewpoint to the problem. It is to be hoped that in his well-deserved retirement from active teaching he will continue his unflagging interest and valuable contributions to the specialty of orthodontics in which he has been such a great inspiration. Much of the art sections of orthodontic textbooks have been inspired by his work and teaching.

H. C. P.

Dr. C. N. Johnson's Tribute to Orthodontics

ONE of the most beautiful tributes ever paid to any department of the dental profession was made by the late Dr. C. N. Johnson. For orthodontists what could be a more cherished memory of this great leader in dentistry than the beautiful thoughts pertaining to their specialty, which he penned only a few years before his death? How could there be a greater tribute than for him to write and publish the following: "It would sometimes seem as if the keenest and most progressive minds in the profession had rallied to the banner of orthodontia and were devoting their lives to its development"? For the present-day orthodontists what could be a greater inspiration for achievement than that quotation? When he wrote those words, Dr. Johnson no doubt had in mind not only the contributions of some of the living, but also the contributions of many who are now gone—Angle, Ketcham, Case, Dewey, Pullen, Young, Baker, Gruenberg, Kingsley, Gray, Dunn, and many others. All these were outstanding individuals who did much more than practice their profession. They lived, dreamed, and breathed orthodontia, as it was then called. They would cross the continent for a new idea and battle to the last ditch for their convictions—that was the pioneer spirit common to them all.

It was just a handful of men who, by their zeal and efforts, created that impression of orthodontics; many of them are now gone. Every orthodontist should, from time to time, read and re-read the following lines (which are reprinted from the *Journal of the American Dental Association*) written by dentistry's loved and best regarded man. Then, he should recall to mind that his specialty has been born of thoroughbred blood. Whether the blood is improved or whether it loses the caste that it has inherited, much depends on the group who now carry on!

ORTHODONTIA

THE science of orthodontia came into the dental profession as a distinct benefaction. Groping at first in the mists and shadows of experimental uncertainty, it has emerged into the clearer atmosphere of a brighter dawn, where its achievements are penetrating the clouds and shedding sunshine over the hearts and minds of men. Sponsored by a small band of noble and devoted enthusiasts in the beginning, it has swept across the horizon of our professional activities till it embraces today the best energy of many earnest practitioners, with an ever increasing interest on the part of the profession and the public.

All honor to the pioneers in this beneficent art—the men who blazed the way—who went ahead and made a path through the dense wilderness of ignorance—long before there was system or cohesion in the movement—long before there were schools teaching the art, or societies everywhere discussing the latest and best in this wondrous specialty. It would sometimes seem as if the keenest and most progressive minds in the profession had rallied to the banner of orthodontia, and were devoting their very lives to its development.

And what a blessing it has all been! Think of the countless lives it has sweetened by its beneficence. It has freed humanity from one of its most glaring deformities, and has transformed the hideous imperfections of Nature into the essence of symmetry and beauty. It has waved the magic wand of its subtle art across the distorted features of little children, and lo, they have come forth perfect in the image of divinity. It has relieved the aching hearts of mothers,

and added to the joy and pride of doting fathers. It has removed from budding youth the blight of prejudice, and destroyed the handicap which threatened to mar a human life.

It has added to health, to beauty, to opportunity, to advancement. It has snatched from many a sensitive child the horror of derision, and planted in his heart the seeds of hope and confidence and courage. It has given children a fair chance where Nature had threatened to trample them under the ruthless feet of deformity. It has sweetened the lives of countless youths, and made possible careers of achievement and success. It has turned despair into hope, and discouragement into the very joy of life.

It has, by its marvelous artistry, molded the human countenance into lines as fair as those of Apollo, and has changed the features of a freak into the profile of a god. It has wrought modern miracles great as those recorded in the script of ancient days, and made the impossible of yesterday the routine and commonplace of today. It has spread the blessings of beauty and harmony over the blighted lives of myriads now on earth, and will do the same for myriads yet unborn.

Out of the chaos of the past—the doubt, the dread, and the despair of disfigurement—has come this beneficent science, to bring solace to the sons of men. And the end is not yet. There are greater achievements ahead, and the future holds high the banner of promise and of pledge.

In the glowing east, we see the many-tinted bow beckoning in the dawning of a better day, when "all the children of all the people" shall be brought under the blessings of this benevolent art, and the cry of despair coming from the hearts of little children shall be banished from the ears of men.

When the possibilities and significance of orthodontia are fully recognized by the world, there shall be recorded for dentistry one of the greatest achievements and highest tributes that have ever fallen to the lot of any calling.

C. N. Johnson.

In Memoriam

B. Frank Gray
1872-1938

On August 26, the host of friends of Dr. B. Frank Gray received the sad news that he had passed away at his home in Berkeley. His summons to eternal rest came suddenly, without any preceding illness, while he was enjoying the pleasant atmosphere of his own home. He is survived by his wife, Florence Dickens Gray.

In his passing, both the specialty of orthodontics and the dental profession have suffered the loss of a valuable member, and one whose life was pledged and

B. Frank Gray.

sustained to its highest principles. Although he had retired from active practice several years ago, the many years he spent in professional activities have left their effect for good, and the memory of the things for which he stood will continue to prove helpful to those who will follow.

He was born in New Richmond, Ohio, in 1872, and was graduated from the Cincinnati College of Dental Surgery in 1899. As a young practitioner, he located in Colorado and spent many years in practice there, both in Colorado Springs and in Denver. He served upon the State Board of Dental Examiners, and also filled positions of responsibility in the Colorado State Dental Society.

In 1905 he was graduated from the Angle School of Orthodontia, and thereafter limited his practice to orthodontics. Feeling the lure of the Pacific Coast he went to California, locating first in Los Angeles, and then in San Francisco, where he continued in practice until his retirement.

He was a most cooperative member of the American Association of Orthodontists, and served as its President in 1910. After moving to California, he filled offices of responsibility in the Pacific Coast Society of Orthodontists as president, and also as secretary of the California State Dental Association. His last efforts in organization work were put in with the American Board of Orthodontia where, from its inception in 1929, he had served continuously.

Dr. B. Frank Gray's professional life stood as an exemplification of the highest principles of ethics wherein the Golden Rule was ever in existence. As a friend, he was loyal and generous, and one whose counsel could always be followed with profit. He enjoyed a happy home life, was a man of simple tastes, and for that reason got much more out of life than do most men. We shall all miss his genial companionship, his wise counsel, his splendid example, and his unswerving friendship.

James D. McCoy.

News and Notes

North Atlantic Orthodontic Society

The ninth semi-annual meeting of the North Atlantic Orthodontic Society will be held on Wednesday afternoon and evening, November 16, at the Hotel Pennsylvania, New York City. All ethical members of the dental and medical professions are cordially invited.

EDWARD A. LUSTERMAN, President,
One Nevins Street
Brooklyn, N. Y.

Chicago Dental Society

The 1939 Midwinter Meeting of the Chicago Dental Society will be held February 13-16 inclusive at the Stevens Hotel. The meeting will once again return to its four-day length after an experiment with a five-day session last year. In 1938 the Midwinter Meeting achieved new records in attendance, with more than ten thousand visitors being registered during the five days. Greatly enlarged commercial and scientific exhibits were also features which will be continued for the 1939 meeting.

Great Lakes Association of Orthodontists

The twelfth annual meeting of the Great Lakes Association will be held in Cleveland, on November 7 and 8, at Hotel Statler.

RICHARD E. BARNES, Secy.-Treas.
1704 Republic Building
Cleveland, Ohio

Tuna Off the Starboard

Imagine, if you can, some of the tired, hardworking, orthodontic leaders of the American Association of Orthodontists getting aboard the twelve-bunk fishing smack, "Snark," at 2 P.M., eight hours late (the original sailing time had been set for 6 P.M.).

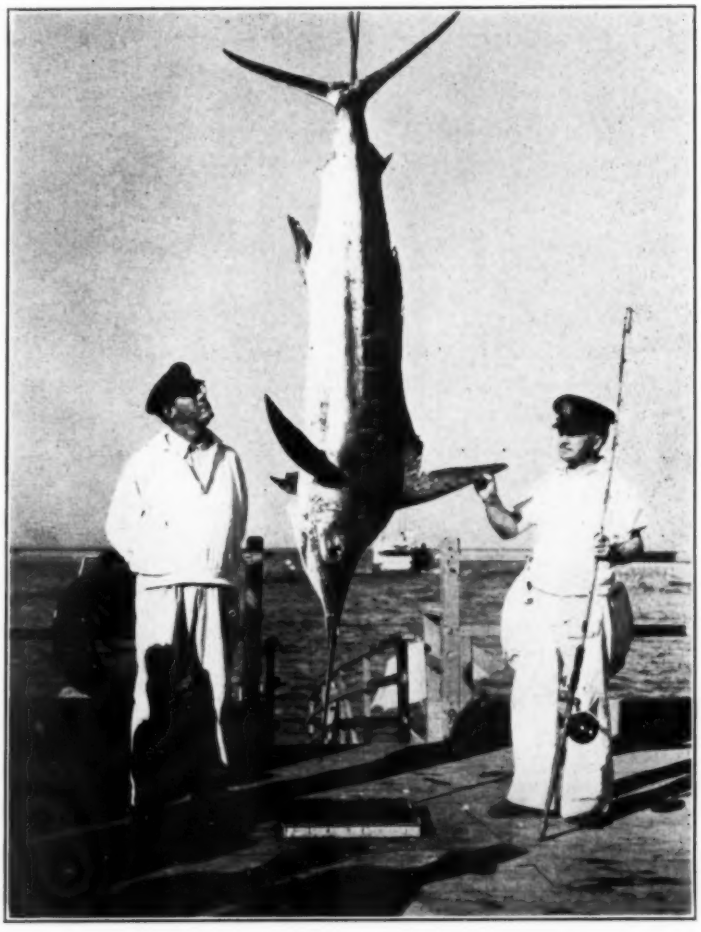
Dr. Walter Furie, chairman of the fishing committee, should have known better than to have expected Harry Allshouse and Claude Wood to be through with convention business and ready to sail at such an early hour, but his enthusiasm overcame his good judgment and he just waited.

With a tank full of sardines and anchovies for bait, a perfect moonlit night, and twelve good fellows full of enthusiasm, the good ship "Snark" weighed anchor and started for Catalina Island, twenty-seven miles away.

"Why sleep on a night like this?" crooned Aldys Gray.

Even the moon was full. The flying fish cavorted around the prow of the boat. The Pacific was as calm as its name signifies. At 4:30 the sun rose over Mt. Baldy in the Sierra Madre Range, eighty miles distant, yet appeared to be only a few miles

Dr. Oliver, Dr. Furie, and Dr. Wood.



away. The few guests who really needed sleep were again awakened to see if they were comfortable, then rushed out on deck with the cry, "Tuna are breaking over our starboard."

The sight of Catalina Island, that jewel which raises its beautiful head two thousand feet out of the sea and beckons seafaring folk (and tourists) to its hospitable shore, fascinated the pseudo-fishermen. After gazing with awe at the tideless surf of azure blue water and the submarine gardens which surround the island, Brooks Bell clicked again by shouting: "It's not true. It's only propaganda of the Los Angeles Chamber of Commerce."

"Be that as it may," answered Skipper Furie, "I brought this gang out to fish, so let's get going."

And some fishing was done in the next two hours. Oren Oliver, John Taylor, and Ben Bolt snagged tuna averaging twenty-five poounds each, but many fine ones were hooked and lost, as tuna are fighting dervishes and difficult to bring to gaff.

At 10 A.M., all efforts to fish ceased, and a leisurely cruise was started around the island. It was a temptation to stop at Avalon, but Skipper Furie knew his passengers, and decided to take no chances; there were too many things to see.

On the homeward trip, the effects of loss of sleep and too much excitement began to show, and the twelve bunks were comfortably filled with tired but happy orthodontists. Since John Taylor refused to take the honors for landing the largest fish, the committee agreed to give the trophy to the man who had added the most enjoyment to the trip, Brooks Bell of Dallas, who had never before had a fishing rod in his hands.

The fishermen were Harry Allshouse, Oren Oliver, Claude Wood, Brooks Bell, Russel Irish, John Taylor, Tyler Phelps, Ben Bolt, Aldys Gray, S. B. Hoskins, Skipper Walter Furie, and H. C. Pollock.

F. M. Johnston.